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CRUISE REPORT
ECO2-8
(Panarea Island, Italy)

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1 OBJECTIVES

Panarea Island (Italy) is one of the target sites investigated within the EU 7th Frame Programme project "ECO2 – Sub-seabed CO_2 Storage: Impact on Marine Ecosystems". Panarea has been chosen since submarine CO_2 seeps are common features around the island and they have been known to be active since historical time [1,2]. Indeed the long-term seepage activity, the high CO_2 content of the released gases and the shallow water depth make Panarea an excellent natural analogue for investigating the effects of CO_2 seepage on marine benthic organisms [2].
During the field trip ECO2-2 (2011) two sites were identified (called "RedPlus" and "GreyPlus" according to their sediment colouring) with high CO_2 emissions, low pH in bottom waters, no elevated temperature, and visible impact on calcareous epibionts. A background site ("GreyMinus") close to "GreyPlus" but not affected by CO_2 was also found, so as to compare the pure effect of CO_2 on biotic and abiotic characteristics. The field trip ECO2-3 (2012) focused on expanding the biological sampling efforts supplementing it with pore-water data to infer on the geologic drivers of benthic communities at the CO_2 seeps, and the installing of transplantation experiments with sediment, terracotta tiles, glass slides, seagrass mimics and marble tiles to identifying short- and mid-term effects of CO_2 seepage on the structuring and dispersal of marine organisms [3]. The geo-physicochemical analyses carried out in last two years confirmed that CO_2 seepage sites and background site showed comparable sedimentary characteristic (i.e. grain size, porosity and density; Figure 1.1), temperature (19.5-20°C) and salinity (ca 4%). Further, at the seepage sites the amount of sulfide or other reduced compounds (i.e. CH_4, H_2) were below the detection limit (<1ppm). The results provide evidence that CO2 flux is the main environmental factors distinguishing the seepage sites from background site. The effect of CO_2 leakage on porewater chemistry was also clearly visible as low pH (ca. 6), high DIC (up to 45 mM) and enhanced chemical weathering (high concentration of Fe, Mn and silicate in the porewates) at the seepage sites. The extensive biological sampling and analysis pointed out the difference in bacterial and meiofauna communities (Figure 1.2), as well as differences in microphytobenthos abundance and prokaryotic activities between seepage sites and the background site.

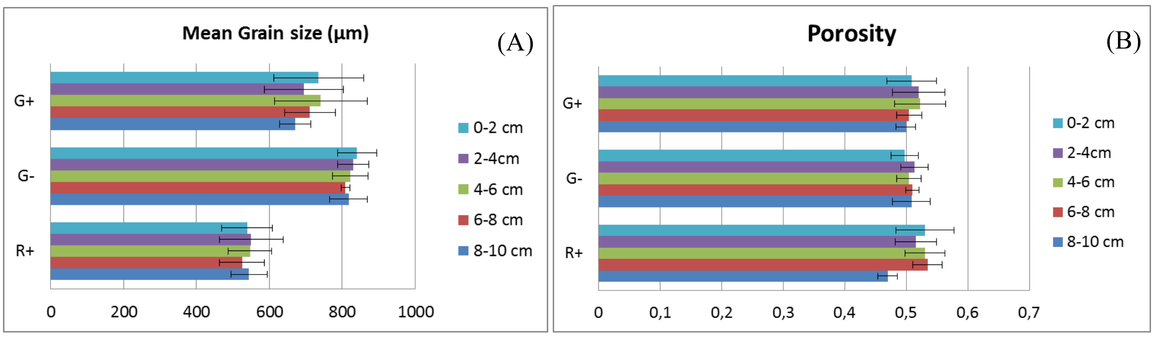


Figure 1.1. Properties of "GreyPlus" (G+), "GreyMinus" (G-) and "RedPlus" (R+) sediments. (A) grain size; (B) porosity of sediment (as ratio of pore and total volume).

The present reports the work conducted at the Panarea sites during the field trip ECO2-8 (2 – 18 June 2013). We extended the monitoring and the investigation of mid-term effects of CO_2 seepage on the structuring and dispersal of marine organisms in order to achieve the following main objectives:

- **verify stability of the site-specific environmental chemical-physical parameters over three years of observations.**

- **observe the inter-annual variability of community structure and metabolic activities of** benthic biota (prokaryotes, nematodes, epibiontes, microphytobenthos).

- investigate the direct and mid-term effect of CO_2-low pH on marine organisms through transplantation, colonization and physiological experiments.

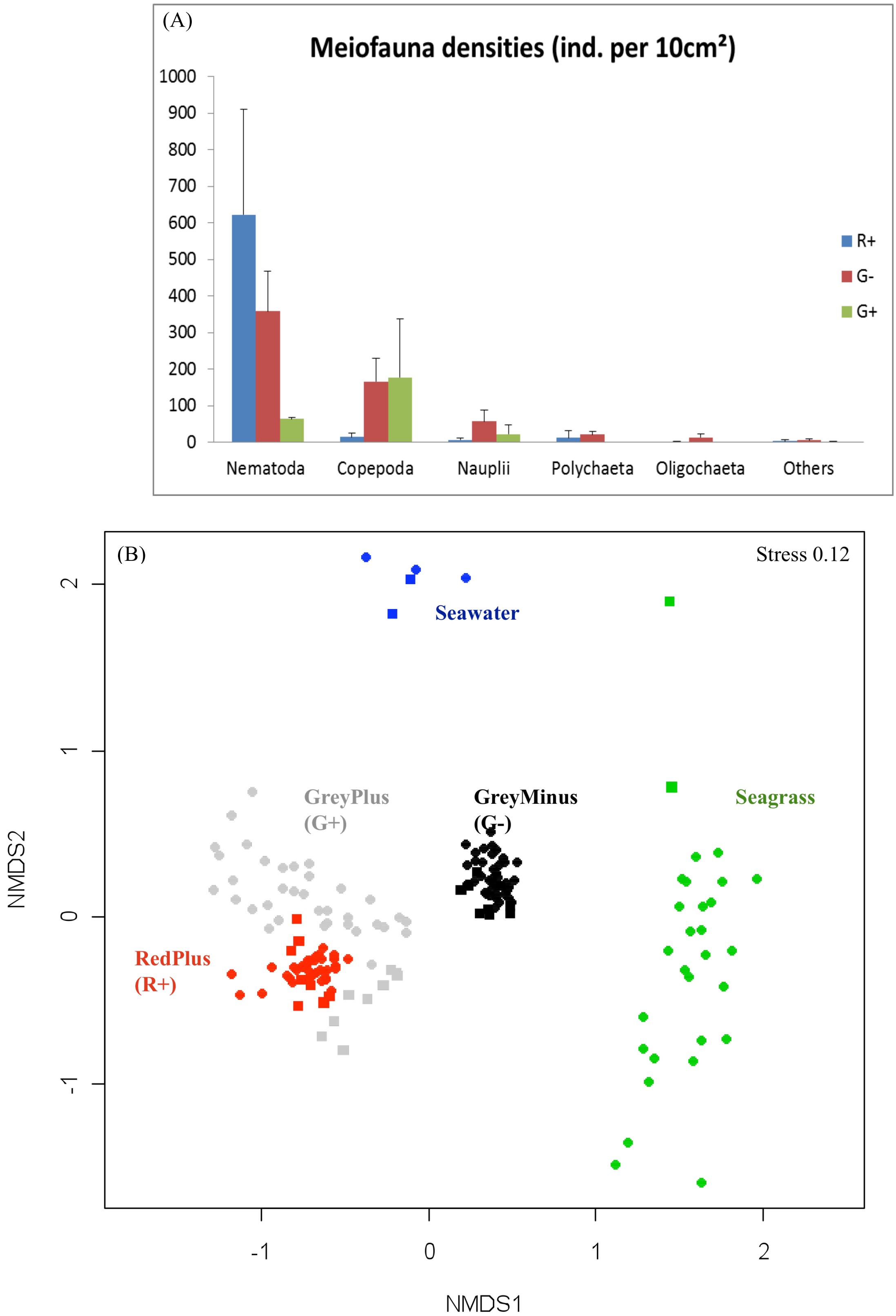


Figure 1.2. Benthic community analyses at "GreyPlus" (G+), "GreyMinus" (G-) and "RedPlus" (R+) sites:

(A) Meiofauna community composition and abundance; (B) difference in sediment bacterial communities as highlighted by Nonmetric MultiDimensional Scaling analysis (NMDS) carried out on results of high-resolution fingerprinting technique (ARISA).

2 NARRATIVE of the FIELD TRIP

All work at sea was conducted from a 8.5 m long inflatable Zodiac boat. For a detailed description of sampling and activity events please see attached table of Station List (as published in www.pangaea.de).

Saturday June 1st

- The HYDRA diving team (Miriam Weber, Christian Lott, Boris Unger, Matthias Schneider, Hanna Kuhfuss, Andreas Eich) arrived on Panarea.

Sunday June 2nd

- The diving team started their work under water. They checked the three sites if the working plan could be conducted as planned.
- Arrival in Panarea of MPI, UGhent and TU Graz scientific crews by ferry from Naples.

Monday June 3rd

- Unpacking and equipping the lab.
- Meeting: HYDRA team reported the state of sites and the inspection of transplanted and stocks with terracotta plates/glass and marbles, and on the base of this information it was planned the sampling schedule.
- At 16:00 h there was the first sampling event with collection of surface sediments and push cores from “GreyMinus” site.

From Tuesday 4th to Wednesday 5th

- With two sampling events per days, continued the collection of samples (natural and transplanted sediments) and measurements at “GreyMinus” site.

From Thursday 6th to Saturday 8th

- Sediments, seagrass and porewater sampling and *in situ* measurements were carried out at “RedPlus” site.

Sunday 9th

- Starting the sampling and measuring activities at “GreyPlus” site.
- Arrival at Panarea Island GEOMAR scientific crew.

Monday 10th

- Continue sampling and measurement activities at “GreyPlus” site.
- GEOMAR team: unpacking and equipment of the lab; first overview dive at the study site (Bottaro Crater).

From Tuesday 11th to Wednesday 12th

- GEOMAR starts the activities at Bottaro Crater: crater mapping; seabed gas flux measurements; test of sensors (HydroC and CTD) in surface waters above the crater; deployment of sensors (HydroC, CTD, and Argonaut) south of the main seepage site
- Last samplings and measurements events at “GreyMinus”, “RedPlus” and “GreyPlus” sites; recovery of sticks with terracotta plates / glass slides and marble plates; cleaning up the study sites.

Thursday 13th

- The MPI, UGent and TU Graz team: laboratory cleaning, equipment and samples packing.
- GEOMAR team: crater mapping; seabed gas flux quantification (whole seepage area).

Friday 14th

- Cold and frozen freight arranging for “GreyMinus”, “RedPlus” and “GreyPlus” samples.
- Departure of HYDRA, MPI, UGent and TU Graz scientific crew.
- GEOMAR team: Crater mapping completed; change vertical position of sensors (HydroC and CTD) to 1.5 m above ground; seabed gas flux quantifications; deployment of the bubble parameterization rack (BPR) at vent Nr. 28 (GoPro Hero III); sampling of gas and water.

Saturday 15th

- Change vertical position of sensors (HydroC and CTD) to 0.5 m above ground; deployment of BPR at vent Nr. 28 (GoPro Hero III); sampling of gas and water at vent Nr. 28; seabed gas flux quantifications; test of underwater-housing (Canon 5D Mark III).

Sunday 16th

- Change measuring position of sensors (HydroC and CTD) to 3 m above ground; water sampling at the inlet of the HydroC; deployment of BPR at vent Nr. 28 (Canon 5D Mark III and GoPro Hero III); sampling of gas and water at vent Nr. 28; seabed gas flux quantifications.

Monday 17th

- Change vertical position of sensors (HydroC and CTD) to 4.5 m above ground; deployment of BPR at vents T, X, 17, 32 (Canon 5D Mark III and GoPro Hero III); seabed gas flux quantifications at low and high tide; fluorescence tracer experiment at vent C.

Tuesday 18th

- Vertical CTD and HydroC profile within the crater; recovery of scientific equipment; fluorescence tracer experiment between Lisca Bianca and Bottaro; packing.

Wednesday 19th

- Packing.

Thursday 20th

- Departure of GEOMAR scientific crew to Kiel.

3 PARTICIPANTS

	Name	First name	Activity	Institute
1	Weber	Miriam	logistics, diving, epibionts	HYDRA
2	Unger	Boris	logistic, diving, photo docu	HYDRA
3	Lott	Christian	diving, timelapse, video docu	HYDRA
4	Schneider	Matthias	diving, epibionts	HYDRA
5	Kuhfuss	Hanna	diving, epibionts	HYDRA
6	Eich	Andreas	Logistic, diving, seagrass oxygen consumption	HYDRA
7	Meyer	Stefanie	microbiology	MPI
8	Molari	Massimiliano	microbiology	MPI
9	Meiners	Mirja	technician	MPI
10	Weiz	Erika	technician	MPI

11	Bigalke	Nikolaus	diving, geochemistry, profiling	GEOMAR
12	Vielstädte	Lisa	geochemistry, profiling	GEOMAR
13	Howe	Christian	diving, sensors	GEOMAR
14	Kreuzburg	Matthias	diving, sensor (student)	GEOMAR
15	Schutting	Susanne	MuFO	TU Graz
16	Guilini	Katja	meiofauna, macrofauna, sediment parameters	UGent
17	Bodnár	Wanda	meiofauna (student)	UGent

HYDRA: Institute for Marine Sciences, Elba Field Station; MPI: Max Planck Institute for Marine Microbiology; GEOMAR: Helmholtz Centre for Ocean Research, Kiel; TU Graz: Graz University and Technology; UGent: Ghent University; MuFO: Multiple Fibre Optics (See 11.4).

4 DESCRIPTION of TARGET SITES

The first task was to relocate the sites last visited in June 2012. In order to plan the sampling activities, all sites were also inspected to see if the transplants, the sticks with terracotta plates / glass slides and marble plates were still there, and the observations were annotated as listed in attached table (Table A1).

“GreyMinus” site (background site)
GPS position 38°39.827’ 15°07.118’
The site looked the same as in June 2011 and after deep investigations in June 2012. It still preserved its proprieties: the sediment was grey coloured and there were no gas seeps in the sampling area (Table 4.1; Figure 4.1D). The seagrass did not look different to previous years. The seafloor showed sediments ripples of about 5 cm height. In between the ripples were loose seagrass and macroalgae accumulations.

“GreyPlus” site (or MixedPlus, seepage site)
GPS position 38°39.820’ 15°07.137’
The site looked the same as in June 2011 and June 2012. Like before, the sediment was orange to grey coloured and gas seeps were evenly distributed over the sampling area (Table 4.1; Figure 4.1C). Area and density of seagrass looked the same as observed during the last survey. The area showed sediment ripples of about 3 cm height.

“RedPlus” site (seepage site)
GPS position 38°39.749’ 15°07.123’
The site looked the same as in June 2011 and in June 2012. Also here the proprieties of site did not show any alterations from previous descriptions, with sediment orange to red coloured and gas seep distributed over whole sampling area (Table 4.1; Figure 4.1A,B). The seagrass did not look different and the area was shaped in sediment ripples of about 5 cm height.

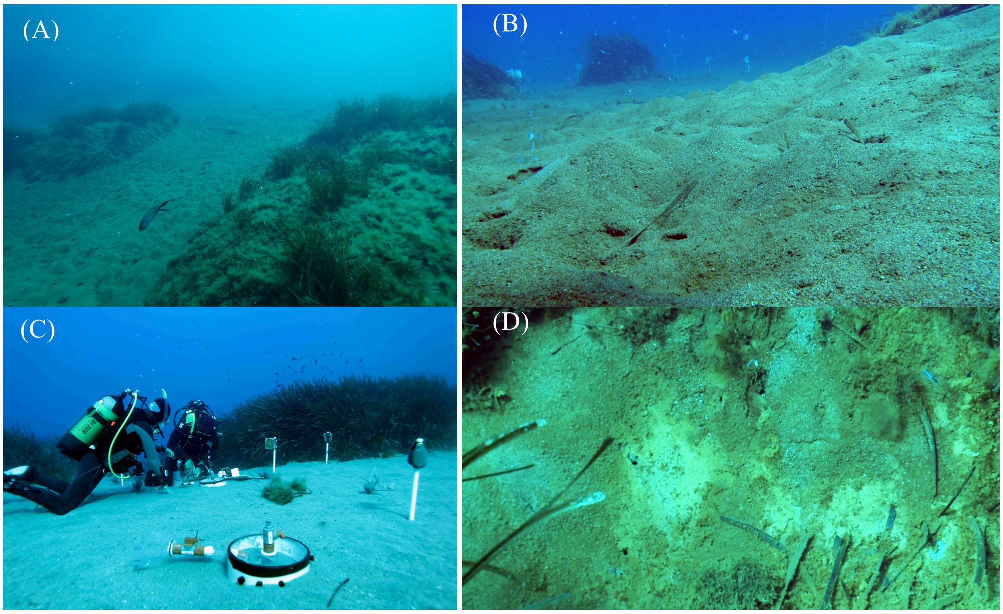


Figure 4.1. Sedimentary sampling sites during field trip ECO2-3 off Panarea Island (Italy): (A)(B) “RedPlus” (seepage site), (C) “GreyMinus” (background site without seepage), (D) “GreyPlus” (seepage site). © HYDRA.

Table 4.1. Main characteristics of the three sedimentary sampling sites at Panarea Island (Italy). Observations were made during field trip ECO2-8 (June, 2013).

	“RedPlus”	**“GreyPlus”**	**“GreyMinus”**
Coordinates	N 38°39.749' E 15°07.123'	N 38°39.820' E 15°07.137'	N 38°39.827' E 15°07.118'
Water depth	14-15 m	21 m	14-16 m
Temperature	18°C	18°C	18°C
Gas emission	yes	yes	no
Area	10 × 20 m	2 areas, each 3.5 × 5 m	10 × 10 m
Substrate	fine-medium sediment	fine-medium sediment	fine-medium sediment
Substrate color	grey-red mixture	grey	grey
Seagrass present?	yes (*Posidonia oceanica*)	yes (*Posidonia oceanica*)	yes (*Posidonia oceanica*)
Seagrass epibionts (first impression)	hydrozoa & bryozoa, but also calcareous	hydrozoa & bryozoa, but also calcareous	calcareous, but also hydrozoa & bryozoa

5 BENTHIC BIOLOGY and GEOCHEMISTRY

5.1 Biological Sampling of Sediment

5.1.1 Bacteria

Natural sediment samples for analyzing bacterial communities were obtained by using segmented push cores (0-2 cm intervals, maximum length up to 15 cm) and sterile Sarstedt tubes (for scooping 0-2 cm surface sediment). The samples were collected in proximity of transplantation bags. Samples were either directly frozen at -20°C for DNA analyses, or were fixed in 4% formaldehyde/seawater for cell counts. Additional samples were taken for fluorescence *in situ* hybridization (FISH). These samples were fixed for 3-12 h at 4°C in 4% formaldehyde/seawater. The samples were then washed twice with 1×PBS (phosphate buffered saline; pH 7.4) to remove the fixative before being stored at -20°C in a 1:1 mixture of 1×PBS and EtOH (molecular grade) until further use. Bacterial community composition is currently being analyzed in the laboratories of the MPI. Overall, these samples will help to elucidate the potential impact of CO_2 leakage and/or decreased pH on the benthic communities as compared to a non-CO_2-impacted background scenario.

By comparisons with results obtained in previous expeditions to Panarea we will investigate the inter-annual variation of the site-specific prokaryotic assemblages. All analyses are currently in progress at MPI.

5.1.2 Meiofauna

At each site, in the close vicinity of the transplantation bags, 3 replicate meiofauna samples destined for natural community structure analysis were taken with plastic, transparent cores that were precut in 2 cm slices and taped, and which had an inner diameter of 5 cm (equivalent to 19.6 cm^2). After retrieval the cores were sliced, where possible to 10 cm depth, and stored in a 4% formaldehyde-seawater solution. Meiofaunal organisms were retrieved from the sediments after rinsing the sediments with tap water over a 1mm and a 32 µm mesh sieve, and decanting the 32 µm fraction for 3 times. All meiofaunal organisms were identified to higher taxon level under a Leica MZ 12.5 stereomicroscope (8 - 100x magnification), and where possible 50 nematodes per sediment layer are currently being identified at UGent to species level under a compound microscope (1000× magnification). Moreover, two times three replicate meiofauna cores were collected at each site, sliced in 2 cm slices and stored on DESS (3x) and frozen at -2°C. The samples are destined for meiofaunal moleculare analysis and stable isotope analysis, respectively.

5.1.3 Microphytobenthos and Foraminifera

At each site microphytobenthos samples were collected. The top 3 cm of the surface sediment were taken with cut-off 60 ml syringes and fixed in the laboratory at Panarea according to the protocol given by Tamara Cibic, Ph.D., OGS (Istituto Nazionale di Oceanografia e Geofisica Sperimentale). The analysis will be done at the OGS/Cinzia de Vittor.
For foraminifera sampling, surface sediment were scooped into 50 ml Falcon tubes and dried in the laboratory at Panarea. Further analysis will be done at the Uni Bonn/Prof. Martin Langer.

5.2 Sediment Geochemistry

Three replicate plastic core samples per site were subsampled to perform sediment granulometry, porosity, chlorophyll a (Chl *a*), total organic matter (TOM), total organic carbon (TOC) and total nitrogen (TN) analyses. These subsamples were also taken from 2 cm horizons down to 10 cm where possible and dried to the air (for granulometry and porosity) or stored frozen at -20°C (for Chl *a*, TOM, TOC, TN). From the segmented push cores (0-2 cm intervals, maximum length up to 15 cm) several samples were preserved for analyses of methane concentration and CPE (chloroplastic pigment equivalents). For methane concentration, 5 mL of sediment were added to 10 mL 2.5% NaOH in glass vials, mixed and stored upside down at 4°C. For porosity, 3-4 mL of each sediment horizon were stored at 4°C in 5 mL-syringes. For CPE, a 5 mL-syringe was inserted into the core, thereby preserving the natural vertical structure of the sediment. Each syringe was wrapped in aluminum foil and stored at -20°C. All analyses are currently in progress at MPI and Ghent University. Preliminary results on the environmental variables show that Chl *a* was significantly higher in the “RedPlus” sediments compared to both “GreyPlus” and “GreyMinus” sediments. This result is similar to the data obtained in 2012, with the only difference that Chl *a* concentrations in all three sites are considerably lower in 2013 compared to 2012. Granulometry analyses show that sediments became coarser from the “RedPlus”, over “GreyPlus”, towards “GreyMinus” sediments. Comparison between granulometry results from 2012 and 2013 indicate a temporal difference although the differences between “GreyMinus” and “Redplus” remain significant.

5.3 Pore-water Geochemistry

Here we also followed the same sampling strategy and applied the same analytical methods used in previous expedition. Pore-water samples were collected in all sites (“RedPlus”, “GreyPlus” and

"GreyMinus") at "natural" sediments, transplantation bags ("RedPlus" and "GreyMinus"), and sea grass. The variations of pH, DIC (dissolved inorganic carbon), TA (total alkalinity), nutrients (NH_4^+, PO_4^{3-}, NO_2^-, NO_3^-/NO_2^-, Si), sulfide/sulfate/chloride concentrations, Fe/Mn concentrations and Bor (B) concentrations in the pore-water to 10 cm sediment depth were sampled with the help of the TUBO device and by using Rhizons MOM (19.21.21F, mean pore size 0.15 μ m; Rhizosphere Research Products, Wageningen, Netherlands) attached to 10 mL-syringes (Fig. 4a,b). In principle, the TUBO device was pushed into the sediment and then emptied. At each depth, 2 Rhizons were inserted (with a 90° angle) into the sediment at opposite locations (Fig. 4c). To allow direct comparison with the bacterial samples (0-2 cm intervals), Rhizons were inserted at 1, 3, 5, 7 and 9 cm depth. At each of the investigated sedimentary sites ("RedPlus", "GreyPlus" and "GreyMinus"), 3 replicate pore-water profiles were taken.
Measurements of pH were directly done in the field laboratory, with a pH 96 by WTW (WTW Wissenschaftlich-Technische Werkstätten GmbH, Weilheim, Germany) and an InLab Semi-Micro electrode by Mettler Toledo (Gießen, Germany). pH was determined at ambient temperature and values will have to be adjusted to *in situ* conditions later. Calibration was done with conventional buffer solutions by Mettler Toledo (pH 4.00 and 7.00). The remainder of these samples was stored at -20°C for nutrient analyses.
For DIC and TA, 2 mL pore-water were filled headspace-free into glass vials and stored at 4°C. Analyses will be done in the MPI home laboratories.
Sulfide/sulfate/chloride samples were fixed in plastic vials pre-filled with 0.5 mL 2% ZnAc before being stored at 4°C. In addition to the TUBO-Rhizon strategy, further samples were obtained by using syringes attached to a pore-water lance. The 10 mL-syringes had been pre-filled with 2 mL 2% ZnAc to allow for direct fixation of pore waters under water. Samples were obtained from 5 cm and 10 cm below the sediment surface. In the field laboratory, these samples were transferred to 15 mL-Sarstedt tubes and stored at 4°C. Analyses will be done in the MPI home laboratories.

In order to determinate Fe/Mn concentrations in the recovered pore waters, samples were fixed in plastic vials pre-filled with 0.2 mL 1M HCl before being stored at 4°C. Analyses are currently being done in the MPI home laboratories.
Samples for measuring B content were filled into 4 mL-Polyvials V (PETG; Zinsser Analytic, Northridge, CA), which had been thoroughly washed with diluted HNO_3 (for trace analyses; Roth, Karlsruhe, Germany) and deionized/filter-sterile water. To reduce the pH, 30 μL of 69% HNO_3 (for trace analyses; Roth) were added to each sample before being stored at 4°C. Analyses will be done in cooperation with Dr. M. Haeckel from Geomar (Kiel, Germany).

5.4 Enzymatic activities

The activity of hydrolytic enzymes gives information about the potential degradation of POM by microbial assemblages. Thus measure of enzymatic activity was applied to investigate how different CO_2/pH condition affects the microbial heterotrophic metabolism. The extracellular enzymatic activities were measured in all sites investigated, and in addiction to "natural" sediments (as sampled in June 2012) this year we also assessed the enzymatic activities in surface sediments of transplantation bags. According to previous measurements, the same methodological approach has been applied.
At each site, 4 samples of the surface sediment were obtained. The top 2-3 cm of the sediment were scooped into sterile 50 mL-Sarstedt tubes. In addition, 3 water samples were taken with 50 mL-syringes approx. 10 cm above the sediment surface to set up the experiments. At each site, 4 samples of the surface sediment were obtained. For each site, 3 of the 4 sampling tubes were chosen to set up the essays, while the fourth one was immediately stored at -20°C (backup and for calibration purposes).
In total, 4 different substrates were used to set up the essays, i.e. β-glucoside (β-glucosidase), N-acetyl- glucosamine (chitobiase), Leucine (Leucine-aminopeptidase) and Fluorescein diacetate

(esterase). Duplicates were set up in sterile 15 mL-Sarstedt tubes with each substrate by mixing each time 3 mL sediment and 3 mL filter-sterile seawater with 120 µL of the substrate stock solutions (final concentrations 100 µM for all, except 500 µM for Leucine). Essays were mixed well before and in between incubation at *in situ* temperature (16-19°C). Sampling was done after 0.5 h and 1.5 h by taking off 1 mL of the supernatant and directly transferring it to -20°C (storage in cryo-vials). Vials were kept dark until analyses in the MPI home laboratories.

6 SEAWATER MICROBIOLOGY and GEOCHEMISTRY

In order to obtain background information with regard to benthic bacterial community composition and geochemistry, a 5 L-Niskin bottle was used to sample seawater at a height of approx. 30 cm above each of the sedimentary sampling areas ("RedPlus", "GreyPlus" and "GreyMinus"). All subsequently described analyses are pending and will be conducted in the home laboratories of the MPI.

Sub-samples for pH, nutrients and B concentrations, as well as DIC and TA (but with addition of $HgCl_2$) were processed the same way as pore-water samples (see 5.3). Samples for measuring CH_4 concentration were filled into evacuated and pre-weighed glass containers that contained 2-3 NaOH pellets. Samples for sulfide/sulfate/chloride concentrations were fixed in 15 mL-Sarstedt tubes pre-filled with 2 mL 2% ZnAc at 4°C.

To investigate the bacterial community composition, seawater samples were filtered and filters were stored at -20°C for subsequent DNA analyses in the MPI home laboratories. With the help of a portable vacuum pump, 500 mL of seawater were passed through a 0.2 µm GTTP-filter (Merck Millipore, Billerica, MA). A cellulose nitrate filter (0.45 µm; Sartorius, Göttingen, Germany) was used as support filter. Filtrations were repeated at least three times (i.e. finally at least 2 L of seawater had been filtered per site).

Part of the seawater was fixed with filter-sterile formaldehyde (final concentration of 1%) over night at 4°C in sterile 50 mL-Sarstedt tubes. Finally, 15 mL were filtered through a 0.2 µm GTTP-filter (Merck Millipore), while using a 0.45 µm cellulose nitrate filter (Sartorius) as support filter. Filtrations were repeated 5 times to obtain in total 6 replicate filters (stored at - 20°C). These samples will be used for counting bacterial cell numbers by DAPI-staining and fluorescence *in situ* hybridization.

7 SEAGRASS SURVEY

7.1 Leaf Area Index (LAI)

For the assessment of the leaf density, the seagrass rhizomes were counted in an area of 0.25 m^2. Five counts were conducted per site (Table 7.1). For the leaf area index, the leaves of one rhizome were grabbed at the lowest part and cut off. The leaf bundle was put in one plastic bag. All leaves from one sample were scanned with high resolution on each side for later area determination. From the scans the Leaf Area Index will be assessed during winter 2013/2014 in the HYDRA laboratory.

Table 7.1. Amount of rhizomes of *Posidonia oceanica* meadows in seepages sites and background site at Panarea Island (Italy, 2013). In bracket is reported the depth in meter (m).

	"RedPlus" (seepage)	**"GreyPlus" (seepage)**	**"GreyMinus" (backgr.)**
Rhizome Spot 1	129 (15.4 m)	135 (10 m)	158 (14.3 m)
Rhizome Spot 2	138 (13.2 m)	97 (21 m)	155 (14.6 m)
Rhizome Spot 3	222 (15.4 m)	44 (22 m)	151 (15 m)
Rhizome Spot 4	77 (n.a.)	75 (19 m)	122 (15 m)

Rhizome Spot 5	161 (13.5 m)	88 (18 m)	128 (14.2 m)
Area Counted	0.25 m^2	0.25 m^2	0.25 m^2

7.2 Seagrass Biology

7.2.1 Meiofauna

At the "RedPlus" and "GreyMinus" site, three replicate samples were collected from the natural sea grass beds. The divers collected around 12 to 18 leafs per sample by placing a plastic bag over the leafs and gently cutting of the leafs at the base before closing the bags with elastic bands. The remaining shoots were cut off from the rhizomes and gently transferred into separate plastic bags, with a minimal of transfer through the water column. On land, both leaf and shoot samples were poured on a 32µm sieve to eliminate the water. The material collected on the 32 µm sieve was stored on DESS for later molecular analysis.

7.2.2 Epibionts

From each of five spot (Table 7.1) the upper parts of 20 outermost leaves were sampled for the measurement of calcifying organisms. The upper 10 cm were cut off, scanned, dried and weighed. Then the leaves were put 3 min into 3% HCl-solution, dried and weighed again.
For the assessment of the foraminifera fouling on the rhizomes we first ripped off the leaves and put then gently a plastic bag over the rhizome before twisting it off. Seagrass leaves were sampled by gently moving the plastic bag over a single leaf and twisting it off. It has always sampled the outermost leaf. The samples are being analysed in the laboratories of University of Bonn.

7.2.3 Oxygen production and consumption

The goal was to assess the oxygen dynamics, production and consumption of seagrass leaves.
A total of 10 rhizomes from the "RedPlus" and 10 from the "GreyMinus" sites were sampled for the measurement of respiration rates. The lower most 10 cm were cut off and the outermost leaves were discarded. The leaf pieces were incubated in 100 ml SCHOTT bottles during the night and during the day, and the oxygen and pH were measured. The incubation was done in water from the same site and in a cross-test from the other sampling site.

8 Microrespiration experiment

To test the influence of acidified porewater on the functioning of indigenous meiofauna, in vitro respiration experiments were conducted by means of the Unisense Microrespiration System (http://www.unisense.com; Denmark). Therefore, bottom-seawater was collected with a Niskin bottle at the "GreyMinus" site (10cm above the seafloor). This seawater was filtered on a 0.22µm Millipore filter and stored in a sterile glass bottle of 1L at in situ temperature (18.5-18.7°C). From three replicate samples that were collected at the "GreyMinus" and "RedPlus" site meiofauna was extracted by decantation and filtration on a 1mm and 32µm sieve. From the material remained on the 32µm sieve 50-100 living nematodes, polychaetes and oligochaetes were handpicked with a needle and transferred to the separate microrespiration vials. In each experiment, three control vials only containing filtered seawater were included. When experiments were conducted on meiofauna from the "RedPlus" site, filtered seawater was acidified by addition of HCl (to a final pH of 5.5 which is found in situ) prior to the incubations. Each experiment was conducted in a thermobath at in situ temperature (18.5-18.7°C) over ca. 13 hours, until all oxygen in the vials containing animals was depleted. Before fixation on a 4% formaldehyde-seawater solution the animals were checked for viability. Currently the identity and the biomass of the animals are being determined, after which the respiration measures will be interpreted.

9 TRANSPLANTATION EXPERIMENTS

The last year (June 2012) in order to investigate short- and mid-term effects of CO_2 seepage on the structuring and dispersal of marine organisms transplantation experiments with sediment, conventional Terracotta tiles, glass slides (microscope slides; Menzel-Gläser/Thermo Fisher Scientific, Braunschweig, Germany), seagrass mimics (Bio Models Company, CA; www.biomodelscompany.com) and conventional marble tiles were fitted out.

9.1 Sediment Transplantation

There were two different transplantation strategies: (i) removed sediment was re-implanted at the same site ("self-transplant"), and (ii) removed sediment was re-implanted at another site ("transplant"). For more details about the setting up of transplantation experiments see cruise report ECO2-3 [3].

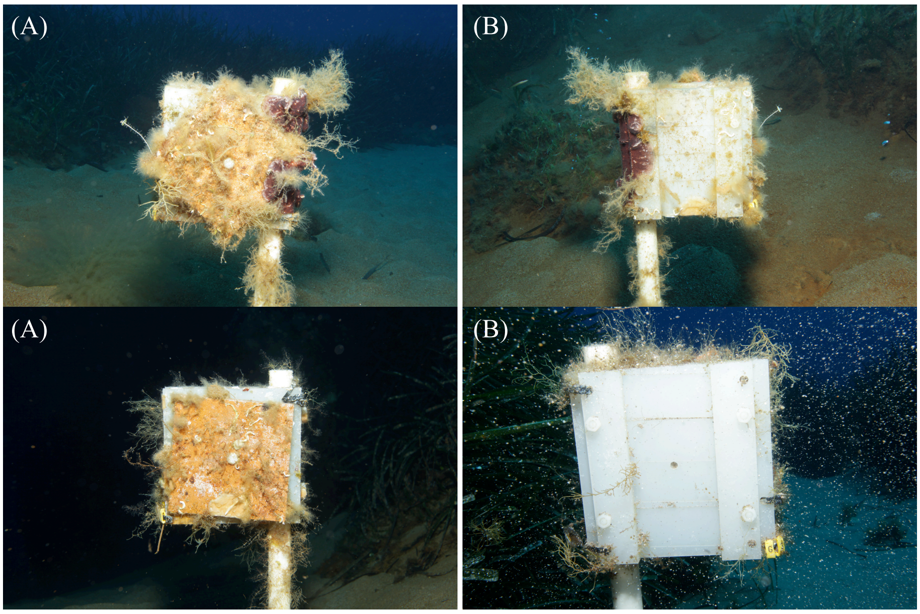
One year after the initiation of the experiment, the transplantation bags (3 replicates) were sampled again in order to determine the mid/long-term changes that might have occurred. From each bag one meiofauna samples was collected, sliced and stored for meiofauna community analysis (see 5.1.2); another sample was subsampled and was destined for granulometry, porosity, Chl a, TOM, TOC and TN (see 5.2). All work is in progress at UniGent. Sediment samples were fixed for DNA analyses, cell counts and FISH (bacteria, MPI; see 5.1.1) as well as for sediment geochemistry (MPI; see 5.2); samples for extracellular enzymatic activities (MPI; see 5.4) and pore-water geochemistry (MPI; see 5.3) were also collected from each bag. All these analyses will be achieved in the next months.

9.2 Terracotta Tiles / Glass Slides

The aim was to investigate the succession of biofilm on hard substrates such as terracotta tiles and glass slides (Figure 9.2.1). Each set up consisted of a POM post on which 1 terracotta tile and 4 glass slides were attached. The posts were randomly positioned at the sites as described in the ECO2-3 cruise report [3]. The remaining POM posts (Table A1) with tiles and glass slide were collected and transported with a plastic bag cover, and then at the surface they were placed into a bucket. Once in Panarea laboratory they were immediately processed as described below.

<u>Glass slides.</u> For bacterial cell counts, one slide per post was scraped and then rinsed with 1 mL sterile artificial seawater (ASW, 38‰). The seawater was transferred into a cryo-vial that had been filled with 2 mL filter-sterile 4% formaldehyde/seawater before being stored at 4°C. Two slides were used for DNA analyses: i.e. one was scraped and rinsed with 1 mL 1 × TE-buffer (molecular grade; Promega Corporation) before being transferred to autoclaved plastic tubes and put to -20°C, the other one was inserted in a sterile plastic tube and directly frozen and stored at -20°C. The samples are currently being analyzed at MPI. The last slide was used for *in situ* microscope enumeration and preliminary identification of metazoan and algae fouling.

<u>Tiles.</u> For bacterial cell counts, 1/3 of tile surface was scraped off before being added to 2 mL filter-sterile 4% formaldehyde/seawater and being stored at 4°C. For DNA analyses, another 1/3 of the tile was scraped and the material added to with 1 mL 1 × TE-buffer (molecular grade; Promega Corporation), and then stored at -20°C. The samples are currently being analyzed at MPI. The rest of the tile was used for microscope enumeration and preliminary identification of metazoan and algae fouling at Panarea laboratory.



Fugure 9.2.1. Fouling grown on terracotta tiles (A) and glass slides (B) positioned one year ago during field trip ECO2-3 (2012) at Panarea Island (Italy). © HYDRA.

9.3 Marble Tiles

In order to determinate the effect of reduced pH on calcium carbonate structure, during the 2012 expedition pre-weighed tiles were deployed along one transect between “GreyMinus” and “GreyPlus” and a second one between “RedPlus” and “GreyPlus” (ECO2-3 cruise report, [3]). At the end of this expedition, after one year of exposure, the tiles were collected. In Panarea laboratory the tiles were catalogued, photographed and dried. Once at the MPI laboratories, the tiles were weighed and from the difference of weight from pre-weight, we calculated the dissolution rates. The dissolution rates ranged between 0.1 to 12.6 mg/d, the higher dissolution rates were observed for the tiles fallen on the seafloor in the CO_2 seep sites.

10 GAS SAMPLING

The aim was to determine the overall gas composition of benthic fluxes at the investigated sites. Sampling and analyses were done in cooperation with Dr. S. Beaubien (UniRoma1, Italy) (Table 10.1).

Gas samples were taken at “Bottaro Crater”, “RedPlus” and “GreyPlus” sites. Sampling was done by holding an exetainer upside down over the seep until it was filled. During surfacing the exetainer had a syringe needle stuck through the septum for the pressure release. The needle was pulled out shortly before surfacing with the samples. On land HYDRA team with a CG measured samples in order to measure H_2. No H_2 was detected in these measurements.

A extra-sampling for potential extended analysis in collaboration with Dr. Franco Italiano (INGV Palermo, Italy) was also done at the “RedPlus” and “GreyPlus” with funnels into gas collecting tubes. The containers were close when full with gas and surfaced without any pressure compensation.

Table 10.1. Gas composition of benthic fluxes at “RedPlus” sites. Data provided by Dr. S. Beaubien (UniRoma1, Italy).

CO_2 (%)	O_2 (%)	N_2 (%)	CH_4 (%)	SO_2 (%)	H_2 (%)	H_2S (%)
98.7	0.2	0.96	N/D	N/D	N/D	N/D
97.8	0.5	1.7	N/D	N/D	N/D	N/D
98.1	0.6	2.2	N/D	N/D	N/D	N/D
99.4	0.3	1.1	N/D	N/D	N/D	N/D

N/D: Not Detect.

11 IN SITU MEASUREMENTS

11.1 Timelapse Camera

The gas flow was monitored for several hours during each deployment with the timelapse technique using a Canon EOS D600 (Figure 11.1A) and the newest GoPro (see 12.3). The gas flow was monitored for several hours during each deployment. The camera was positioned three times at the "RedPlus" site, two times at the "GreyPlus" site and two times at the "GreyMinus" site. HYDRA is currently evaluating these recordings.

11.2 SEAGUARD Recording Current Meter

As during last year's field trip, a SEAGUARD recording current meter (AADI, Norway) was used to monitor current speed and direction, temperature, salinity/conductivity, pressure, turbidity and oxygen concentrations within the water column (Fig. 11.1A). Data analysis is still in progress.

11.3 Benthic / Fluid Chambers

Benthic chambers (Figure 11.1A) were deployed to measure total flux rates of oxygen concentration, nutrients and DIC within a defined volume of sediment and seawater. The benthic chambers were deployed into sediments once at "RedPlus", "GreyMinus", and "GreyPlus" sites. At each deployment light and dark incubation were conducted. According to 2012 sampling strategy, a water sample was taken with a glass syringe from each cylinder at the start and at the end of the deployments. Oxygen concentration was measured in the laboratory at Panarea, nutrients and DIC concentration analyses are still in progress (MPI laboratories). To measure the fluid efflux, bags were attached to each chamber to account for the additional volume during the incubation. The amount of liquid increase was measured in the laboratory at Panarea.

To assess the amount of fluid seepage at the three sedimentary sampling sites the "fluid chamber" has been used (Figure 11.1B), as developed in June 2012 trip and previously described [3]. During each deployment, the fluid chambers were put into the sediment to approx. the same height. The lid was closed with tape and 3 holes in the frame were closed with rubber plugs. The time of the start and the end of the deployment were noted. Each fluid chamber was sampled at the end of a deployment. Via a valve, samples for fluid analysis were taken into small and big serum bottles. Fluid analysis from serum bottles will be potentially done by Dr. F. Italiano (INGV Palermo, Italy). Bags for volume compensation were attached at each chamber and the amount of liquid volume increase was measured in the laboratory at panarea.

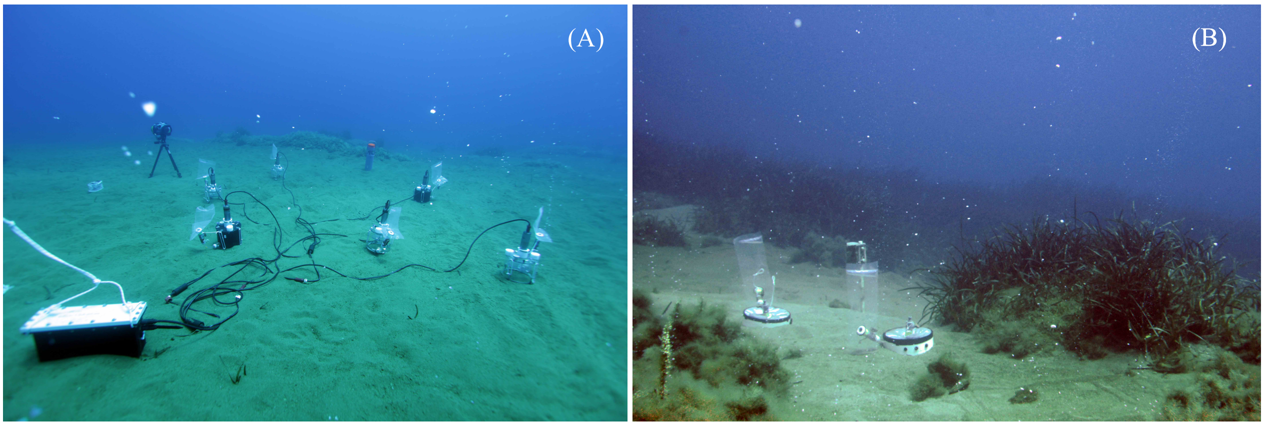


Figure 11.1. *In situ* devices deployed during field trip ECO2-8 (2013) at Panarea Island (Italy). (A) timelapse camera, benthic chamber and SEAGUARD (with orange top; AADI, Norway); (B) fluid chambers. © HYDRA.

11.4 MuFO

The idea

MuFO (Multiple Fibre Optics) is an optical sensing device for measuring pCO_2. The aim was to measure carbon dioxide with 100 different fibres to be placed in an array, with only one excitation source on one end (Figure 11.4.1). The measurement principle is based on optical chemosensing. The MuFO device consists of 3 main parts: The sensor that contains a pH-sensitive dye, the optical fibres that guide the excitation/emission light and the camera that takes pictures of the polished fibre ends.

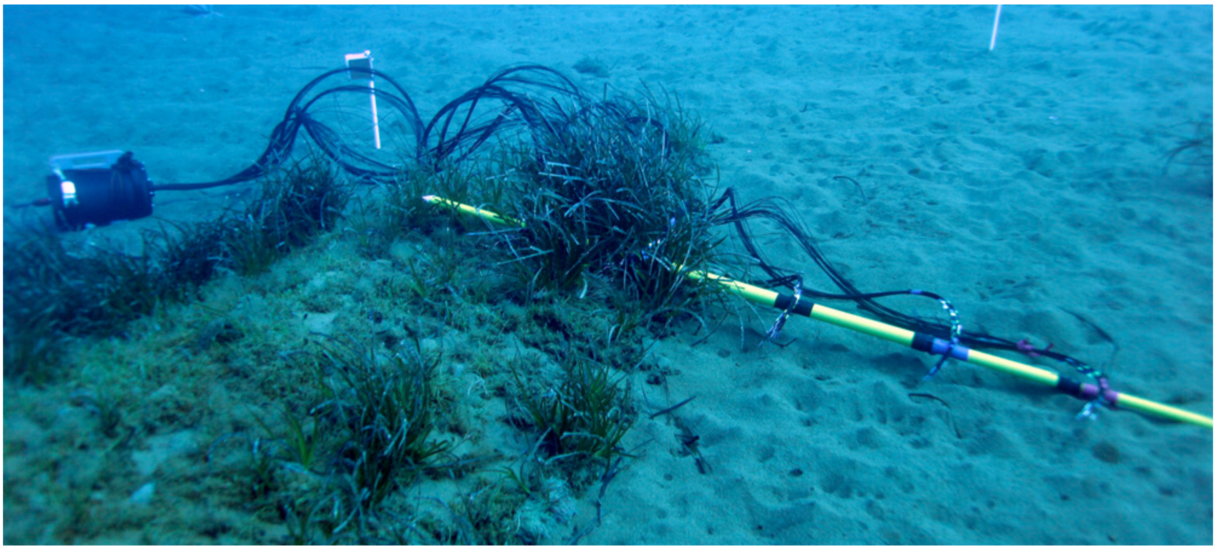
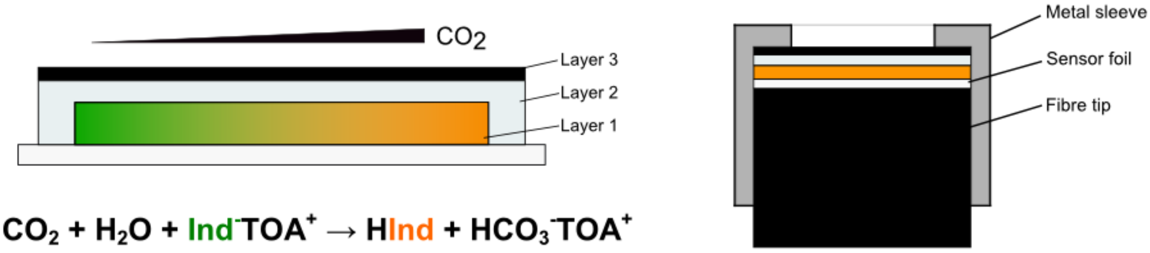


Figure 11.4.1. MuFO device at the sea ground with fibre bundles positioned over sea grass and sand. © HYDRA.

The principle

On the tip of every fibre a sensing foil is fixed via a metal sleeve (Figure 11.4.2, right). The sensing foil consists of three layers knife coated on a PET supporting foil. Layer 1 contains a "sensing-chemistry": a pH-sensitive dye and a base embedded in an ethyl cellulose matrix. Layer 2 is a protective silicone layer impermeable for protons to avoid interferences with the pH of the sea water and permeable for CO_2. Layer 3 is a black silicone layer to avoid interferences from the surrounding light. When carbon dioxide enters the ethyl cellulose matrix bicarbonate and protons were built and the indicator dye gets protonated according to the principle mentioned in figure 11.4.2 (left).



$$CO_2 + H_2O + Ind^-TOA^+ \rightarrow HInd + HCO_3^-TOA^+$$

Figure 11.4.2. Left: Configuration of a CO_2 sensor foil and principle of protonation/deprotonation of an indicator dye. Right: Fixation of the sensor foil at the fibre tip via a metal sleeve.

During the measurements the excitation light of LEDs is guided through the fibres to the sensing foil. When excited the dye emits light with different wavelength maxima corresponding to its protonated or deprotonated form depending on the pCO_2. The emitted light is guided back through the fibres and the camera takes a picture of the polished fibre head that holds the polished ends of all 100 fibres in a 10 x 10 matrix (Figure 11.4.3). The optical filter system has been improved. The excitation light is filtered (DT-Blue filter) and also the emitted light (500 nm longpass filter, plastic filter and Calflex X filter in front of the camera). Via software the pictures are analyzed for their red, green and blue channel, which contain the information of emitted light. After a calibration with certain pCO_2 values the pCO_2 can be calculated.

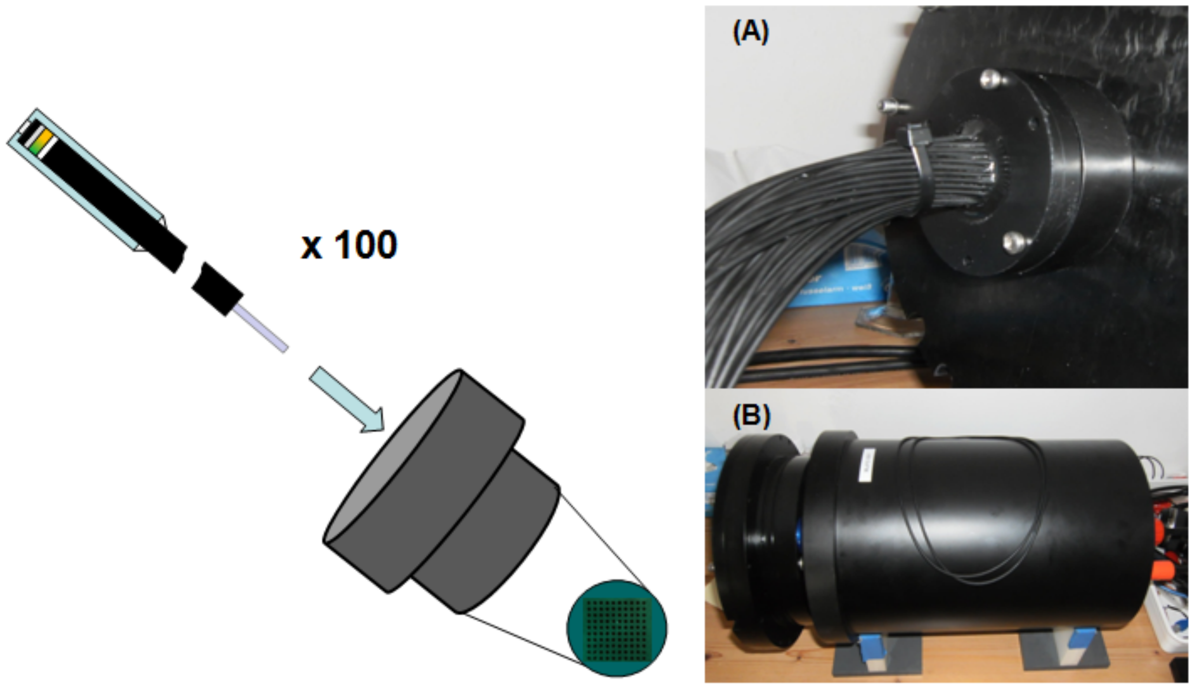


Figure 11.4.3. Left: Scheme of the 10 x 10 matrix. Right: (A) Fixation of the fibre head to the camera housing. (B) Housing with camera and excitation LEDs inside.

Measurements

In 2012 calibration and software problems occurred. During the imaging the background light of the pictures was not filtered well enough. Therefore, after the cruise in 2012 the software was enhanced and the calibration method was changed. The optical filter system and the camera settings were optimized to avoid disturbing background signals.

In 2013 the MuFO was used at three different sites:

- "GreyMinus" site where the sediment was grey and no bubbling was observed.
- "GreyPlus" site, where the sediment was grey and weak bubbling was observed.
- "RedPlus" site, where the sediment had a rubiginous colour and strong bubbling was observed.

Measurements were carried out once during the day and once during the night for each site, respectively. For easier handling the fibres were combined to 5 bundles with 20 fibres each. The 5 bundles were fixed to a stick for an easier positioning. One bundle was positioned over seagrass and two over the sediment.

In general, "GreyMinus" showed low pCO_2 values in the range of atmospheric levels, at "GreyPlus" pCO_2 values were a bit increased and at "RedPlus" pCO_2 values were high. In depth analyses of spatial variations are currently carried out.

12 PLUME PARAMETERIZATION and GEOCHEMICAL SURVEY

12.1 Introduction

In June 8th to June 20th 2013 a submarine CO_2-rich hydrothermal vent site 3 km east of the Aeolian island of Panarea (Italy) was visited to (a) investigate the CO_2 gas bubble flux at the seabed, (b) study the dissolution behaviour of natural CO_2 bubbles (i.e. bubble size spectra, bubble shrinkage and rise velocity, as well as gas and water chemistry), (c) investigate plume dynamics, and (d) measure the subsequent dispersal of the dissolved CO_2 plume under the measured ocean current and tidal forcing. Bottaro Crater was chosen as study area because gases are emitted at a water depth easily accessible by scuba divers (~12 m) and from an isolated seepage area (Figure 12.1 and 12.2). Seepage occurs by diffuse bubble emission as well as single bubble plumes at the edge of the crater. Currents are dominantly wind-driven with a preferred NW-SE direction.

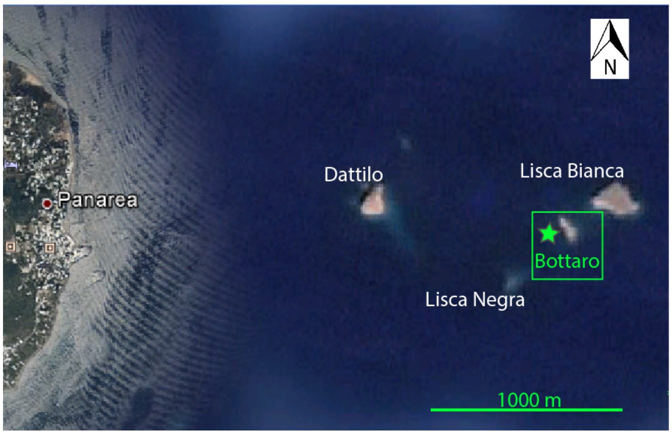


Figure 12.1
The working area (green star) was located near the small rocky island Bottaro, 3 km east of the volcanic island Panarea.

Figure 12.2
Overview of the study area with single vent in the front and diffusive seepage in the back of the image.

12.2 Methods and Preliminary results

12.2.1 Crater mapping

A systematic mapping of the entire crater was carried out prior to estimating total CO_2 emissions from local flow measurements. The extension of the crater floor was measured in NW-SE and NE-SW direction. The area was divided into 4 m^2 quadrants. Each node was marked and numbered. Video survey by divers provided information on the spatial distribution of seepage within the crater. Vent locations and other seepage related features within the crater (i.e. bacterial mats, plume appearance, sediment characteristics) were captured on HD-video by diver crossing the crater at constant depth in NW-SE direction.
The crater rim forms an irregular oval shape with NW-SE and NE-SW axes of ~ 25 and 6 m, respectively. The main seepage area is focused to the southern part of the crater, which is characterized by diffusive bubble emissions. Numerous discrete gas vents with stronger emissions occur along the SW rim of the crater (Figure 12.5). No seepage was observed within the shallower northwest part of the crater. Whitish bacterial mats are a prominent feature for active seepage within the crater.

12.2.2 Quantification of gas fluxes

Depending on seepage activity gas fluxes were measured in-situ using 10 L buckets and 2 L measuring cylinders connected to funnels with a diameter of 25 cm (Figure 12.3 and 12.4). The fill time and volume was either recorded by diver (cylinder) or derived from video data (bucket). The gas flux of the entire crater area was measured on 13th June 2013 at the marked nodes. The temporal variability of gas emissions was estimated from replicate flux measurements at predefined locations twice daily from 14-17.06.2013.

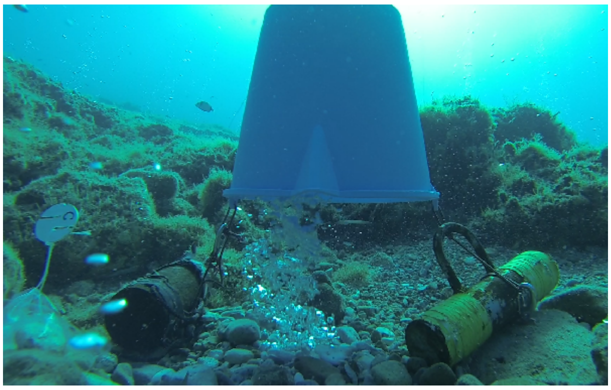


Figure 12.3
Improvised gas flux measurement approach using a modified 10 Litre bucket to quantify gas emissions at stronger single vents.

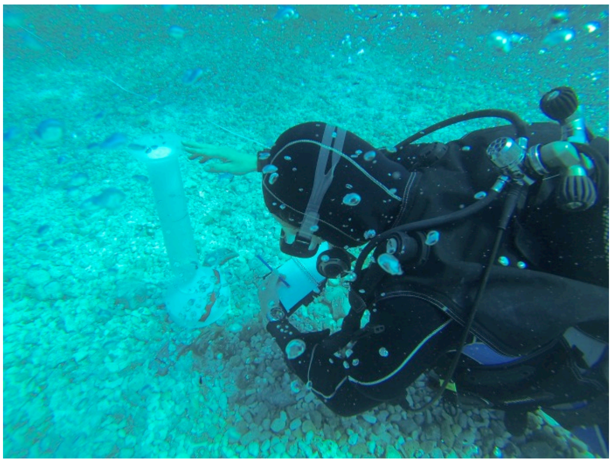


Figure 12.4
Improvised gas flux measurement approach using a modified 2 Litre cylinder connected to a funnel.

A total of 30 direct flow measurements were done at the 13th of June 2013. Measured gas flows ranged locally from 0.58 to 453 L min^{-1} m^{-2} (STP). Maximum values were observed at vent C and B. Replicate measurements within in the diffusive seepage area showed very high temporal variability ranging from ±15.7% to ±215% (avg. temporal variability of 67%) within 5 days. Flux variations of single vents were heterogeneous on short time-scales and not correlated to tides. However, temporal variability of bulk gas emission in the diffusive exhalation area in the crater (numbers in Figure 12.5) and of the stronger vents at the crater rim showed lower temporal variability of between ±24% and ±2%, respectively. We therefore suggest that seep features are interconnected through subsurface channels, and thus variations in seepage at different locations are related to each other. This has also been observed at other seep sites (i.e. Coal Oil Point) by Leifer and Boles [4], who simplified the relation of gas flux variability and seep fracture network in an electrical flow model. At Bottaro Crater entire diffusive seepage activity showed a decreasing trend within the 5 days of observation, which correlates to a decrease in tidal range.

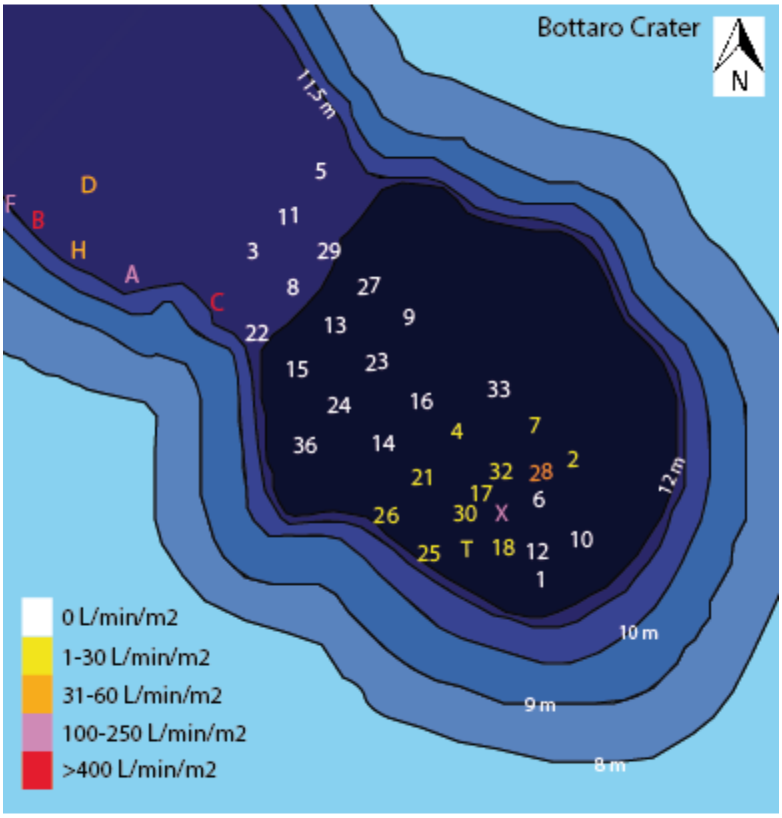


Figure 12.5
Sketch of Bottaro Crater. Numbers denote nodes of the grid spanned across the crater floor. Letters at the crater rim represent discrete vents. Gas flux (STP) at marked locations is colour coded.

Total site flux estimations indicate a seabed emission of 216 L per day only from the main diffusive seepage site. Including all single vents at the outer rim of the crater, a total of 307 L of gas was released from the seabed per day (0.65 kT/a), indicating that localized gas ebullition via vents contributes 30% to the total emissions at Bottaro Crater.

12.2.3 Parameterization of gas bubble dissolution behaviour

To measure natural CO_2 bubble dissolution behaviour optically a bubble parameterization rack (BPR) has been developed (Figure 12.6). The BPR enables to measure bubble sizes and rise velocities in high resolution from the seafloor to 80 cm above ground. Two cameras (Canon 5D Mark III and GoPro Hero III) and additional light were mounted on a vertical adjustable plate allowing the observation of bubbles during their ascent in 20 cm intervals. Bubbles were imaged against a dark background at known distance from the cameras.

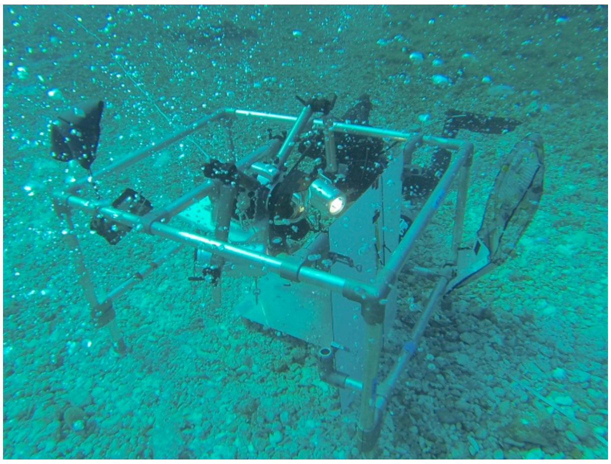


Figure 12.6
Mobile rack (BPR) to image bubble parameters .

12.2.3.1 Bubble size spectra

The bubble size spectra of 8 vents are being determined from the Canon 5D Mark III footage. The vertical camera position was changed in 20 cm intervals, taking images from the seafloor to 80 cm above ground. The camera was programmed to take a series of up-to 5 pictures each second, ensuring that a single bubble can be followed in at least 2 pictures of a series.
First results indicate that the initial (at the seafloor) bubble size spectra are very broad (Figure 12.7). Bubble sizes range from 0.1 mm to >5 mm.

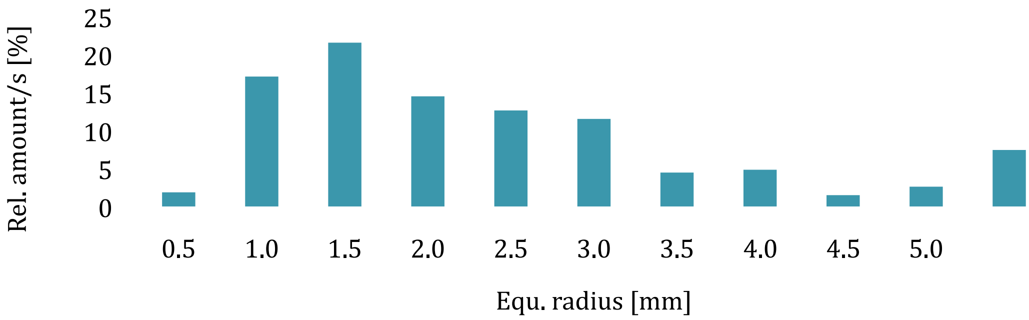


Figure 12.7 Broad initial size distribution at location Nr. 32.

12.2.3.2 Bubble rise velocity

The rise velocity of bubbles was measured with a small high-speed camera (GoPro Hero III) that was mounted on the BPR. Several hours of video data have been recorded at 5 vent positions. The camera was programmed to take 60 frames per second, allowing to track individual rising bubbles and shape oscillations in detail. Manual analysis of video data is currently in progress.

12.2.3.3 Chemistry of gas and water

Water and gas samples were taken at various depths and locations of Bottaro Crater to analyze changes in gas bubble composition, solute gas concentrations (i.e. CO_2, O_2, N_2, H_2S) and total alkalinity in ambient seawater as a function of bubble rise height. Additionally, two discrete water samples were taken at the inlet of the pCO_2 sensor for inter-comparison of TA and pCO_2 measurements. The samples are currently analyzed in the laboratory.

12.2.4 Solute dispersion in the near-field of CO_2 seepage

CTD and current flow measurements were done in parallel to pCO_2 logging and were performed using a Seabird SBE 37-SM MicroCAT recorder and a current meter (SonTek Argonaut S/N D338).

pCO_2 values were measured with the commercial HydroC^{TM} from CONTROS. The CTD and HydroC were deployed on a vertical adjustable rack ~15 m to the south of the main vent field. The current meter was deployed separately 4.5 m above sea floor (masf) and about ~6 m southeast of the CTD and HydroC to avoid any electromagnetic interference with the compass of the Argonaut. Long-term pCO_2 measurements were performed in different vertical heights above seafloor (0.5 to 4.5 masf) to address the vertical dispersion of the solute CO_2 plume. Additionally, a fluorescence tracer experiment was performed at a stronger single vent to visualize plume dynamics and solute dispersion. Therefore 10 g of the fluorescence tracer were injected at the bottom of vent C. The dispersion of the dye was recorded by video from three different perspectives simultaneously. CTD measurements show the occurrence of a thermocline at ~3 m water-depth, 15 m to the south of the main seepage area. The thermocline above the floor of the crater appeared to be disturbed by rising gas bubbles and advection of warm hydrothermal fluids (Figure 12.8).

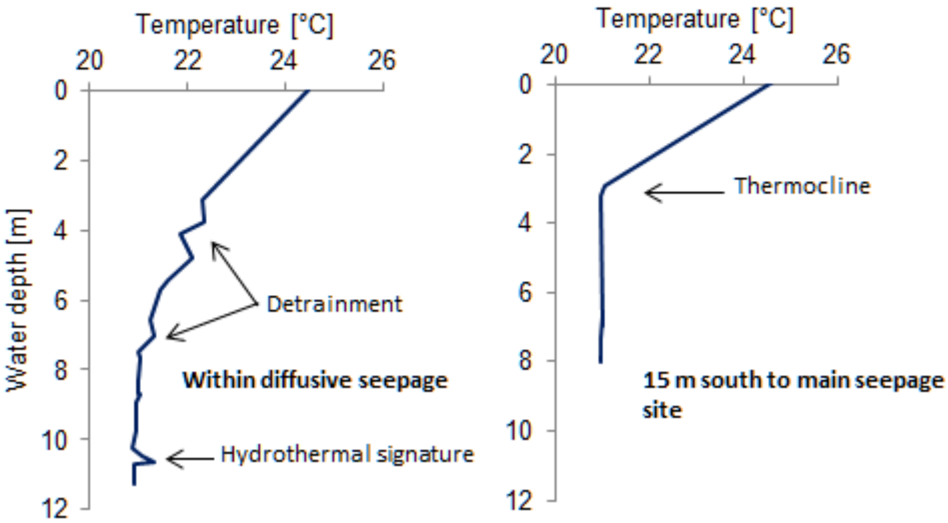


Figure 12.8
CTD measurements within and outside the seepage area reveal a thermocline at approx. 3 mbsl and bubble driven transport of bottom water to shallower depths.

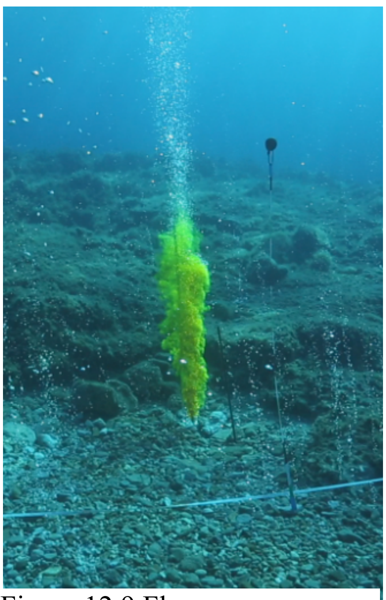


Figure 12.9 Fluorescene injection into Vent C.

Current directions were predominantly wind driven with a preferred SE component. Current velocities ranged from 0 - 15 cm/s indicating rather low current speed during our campaign (Figure 12.10).

pCO_2 values were measured 15 m to the south of the crater and showed pCO_2 values up-to 12000 µatm. pCO_2 decreased with decreasing water-depth to background values at 3.5 m water depth (Figure 12.10). First results of the fluorescence tracer experiment (Figure 12.9) indicate that entrained plume water rose with a velocity (v_{up}) of ~ 55 cm/s. The dyed water reached a height of approx. 3.5-4 masf before being transported horizontally to the southwest by the local currents. Rising gas bubbles and fluid advection above the crater caused the dye to rise up to 3 mbsl, where it stayed.

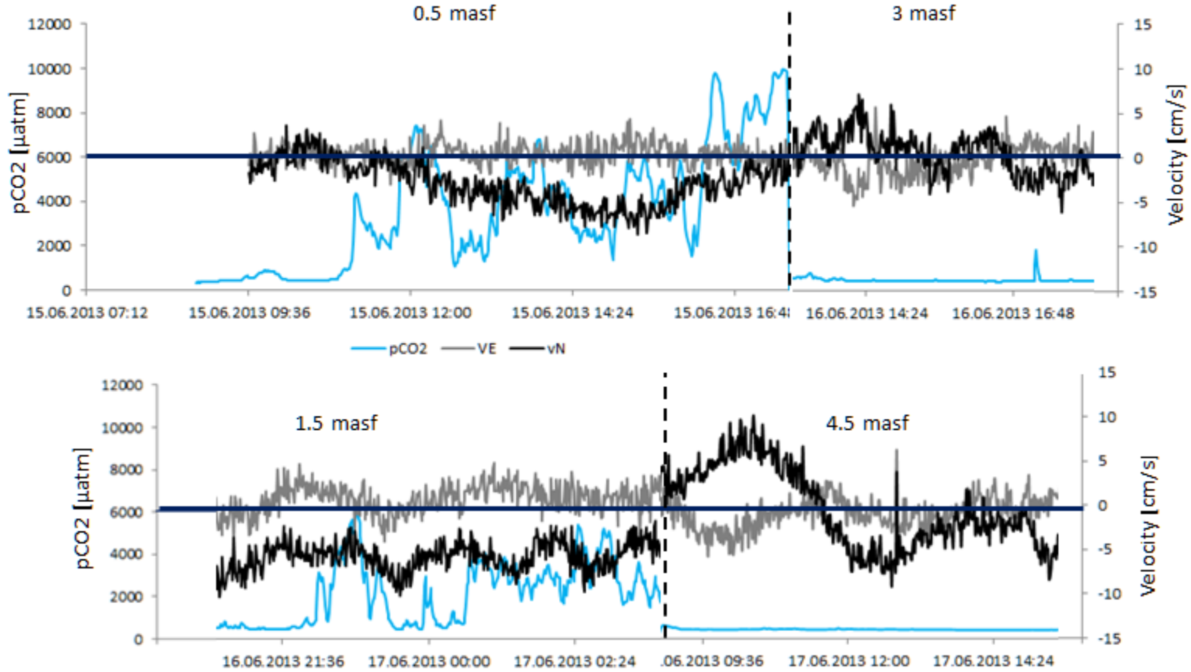


Fig. 12.10
The profile shows measured pCO_2 values (cyan) and current velocities in east (grey) and north (black) direction from the 15^{th} to 17^{th} of June. The vertical position of the pCO_2 sensor changed from 0.5 to 4.5 m above seafloor (masf). Maximum pCO_2 were detected close to the seabed and at low current speed to the south/south east (Sensor position relative to seepage area). Background pCO_2 values were measured at 3 mbsl, coinciding with the thermocline.

12.3 Summary

pCO_2 values generally decreased with increasing distance to the seafloor and reached background values at around 3 m water-depth (~9 m above seafloor). Maximal pCO_2 values were measured close to the seabed (0.5 m above ground) and exceeded a value of 10,000 µatm 15 m downstream of the seepage area. This indicates high gas emissions and low dilution of the solute in the absence of strong tidal cycles and at lower current velocities compared to a North Sea setting. The natural size spectrum of gas bubbles at Bottaro Crater is broad with largest bubbles reaching 5 mm radius. Largest bubbles allowed gas transport to shallower depths. Moreover, the fluorescence tracer experiment established an additional upward transport component caused by rising gas bubbles as well as by advective hydrothermal fluids. Both fluorescence data and pCO_2 data show that these mechanisms are effective as long as the bubble number density is high enough to entrain enough surrounding water and/or a significant density-difference between warm hydrothermal fluids and the surrounding water remains. This implies that the impact of CO_2 seepage is limited to bottom waters. Dissolution of CO_2 from small bubbles is particularly rapid, indicating that the environmental impact on the marine benthos is highest from this size fraction.

13 OTHER ON-SITE COOPERATIONS

Activity	Scientist	Institute/University
Sensor testing	Dirk de Beer	MPI Bremen
Gas analysis	Stan Beaubien	UniRoma1
Gas and Fluid analysis	Franco Italiano	INGV Palermo
Microphytobenthos	Cinzia de Vittor	OGS Trieste
Foraminifera	Martin Langer	Uni Bonn
Sediment analysis	Broder Merkel	TU Freiberg

14 ACKNOWLEDGEMENTS

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16 ATTACCHED

Table A1. Remaining of field trip ECO2-3 (2012).

site	Sample #	Samples	Comments
GreyMinus	G31, G32, G36	3 sticks with terra-cotta plates and glass slides	Upright, fouling
	G33	1 stick with terra-cotta plates and glass slides	Laying on the sediment, fouling
	M71, M81	2 sticks with marble plates	Upright, fouling
	n.a.	Transect of sticks with marble plates	Towards the GreyPlus site
	K14	Transplantation experiments	Standing out 3/4 of the sediments, fouling
	K6	Transplantation experiments	Standing out 1/4 of the sediments, fouling
	K20	Transplantation experiments	Standing out 1/4 of the sediments, fouling
	K17	Transplantation experiments	Fouling
	K10	Transplantation experiments	Fouling
	K16	Transplantation experiments	Fouling
	K5	Transplantation experiments	Fouling
	K18	Transplantation	Fouling

		experiments	
	K12	Transplantation experiments	Fouling
	K1	Transplantation experiments	Fouling
GreyPlus	G16, G17, G19, G20, G24, G30	6 sticks with terra-cotta plates and glass slides	Upright, fouling
	n.a.	3 stick with marble plates	Upright, fouling
	n.a.	Transect of sticks with marble plates	Towards the RedPlus site
RedPlus	G3	1 stick with terra-cotta plates and glass slides	Laying on the sediment, fouling
	M22	2 sticks with marble plates	Upright, fouling
	n.a.	Transect of sticks with marble plates	Towards the GreyPlus site
	K1	Transplantation experiments	Fouling
	K9	Transplantation experiments	Fouling
	K2	Transplantation experiments	Fouling
	K8	Transplantation experiments	Fouling
	K4	Transplantation experiments	Fouling
	K13	Transplantation experiments	Fouling
	K3	Transplantation experiments	Fouling
	K7	Transplantation experiments	Missing
	K11	Transplantation experiments	Missing
	K13	Transplantation experiments	Missing

17 STATION LIST (as published in www.pangaea.de)

LabelEvent	Campaign	Area name	PANGAEA Device	Device	Latitude	Longitude	Elevation	Date/Time	Comment
ECO2-8-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-02T00:00:00	grey no gas; site exploration
ECO2-8-2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-02T00:00:00	red with gas; site exploration
ECO2-8-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-03T00:00:00	red with gas; bags documentation
ECO2-8-SeagrassE-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-03T00:00:00	red with gas; LAI, epibionts
ECO2-8-UniB-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-03T00:00:00	red with gas; seagrass Foram (Uni. Bonn)
ECO2-8-PUC-test	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-03T00:00:00	red with gas; test cores
ECO2-8-4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; bags documentation
ECO2-8-PUC-7a	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-PUC-E1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-F1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-G1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-H1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-9a	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-PUC-K1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-I1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-J1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-L1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-12a	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-PUC-A1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-B1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-C1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-PUC-D1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments (UGent)
ECO2-8-FT-1	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-2	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-3	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-4	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-5	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-6	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-7	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-8	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-9	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-10	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-11	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-12	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-13	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-14	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-15	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-16	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-17	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-18	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-19	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-FT-20	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; natural sediments
ECO2-8-PW-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; Porewater profile
ECO2-8-PW-2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; Porewater profile
ECO2-8-PW-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; Porewater profile
ECO2-8-PUC-Ex1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-03T00:00:00	grey no gas; extra core for freezing

ECO2-8-CHAM-1a	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas;
ECO2-8-CHAM-2a	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas;
ECO2-8-CHAM-3a	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas;
ECO2-8-CHAM-4a	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas;
ECO2-8-CHAM-5a	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas;
ECO2-8-CHAM-6a	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas;
ECO2-8-RCM-1	ECO2-8	Panarea	Current meter	Current meter	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas;
ECO2-8-TL-1	ECO2-8	Panarea	Video camera	Video camera	38.66378	15.11863	-15	2013-06-04T13:00:00	grey no gas;
ECO2-8-FT-EEA1	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-FT-EEA2	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-FT-EEA3	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-FT-EEA4	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-FT-EEA5	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-FT-EEA6	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-FT-EEA7	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-FT-EEA8	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-FT-EEA9	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; natural sediments
ECO2-8-SS-EEA1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA5	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA6	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA7	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA8	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA9	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; seawater for EEA
ECO2-8-SS-EEA10	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:01	grey no gas; seawater for EEA
ECO2-8-FT-EEA10	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; red with gas transplanted in grey no gas (K17)
ECO2-8-FT-EEA11	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; red with gas transplanted in grey no gas (K5)
ECO2-8-FT-EEA12	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; grey no gas internal transplanted (K20)
ECO2-8-FT-EEA13	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; grey no gas internal transplanted (K12)
ECO2-8-FT-EEA14	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; red with gas transplanted in grey no gas (K15)
ECO2-8-FT-EEA15	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; grey no gas internal transplanted (K6)
ECO2-8-FT-EEA16	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; grey no gas internal transplanted (K18)
ECO2-8-FT-EEA17	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; red with gas transplanted in grey no gas (K16)
ECO2-8-FT-EEA18	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; red with gas transplanted in grey no gas (K10)
ECO2-8-FT-EEA19	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; enzime activity; grey no gas internal transplanted (K14)
ECO2-8-NIS-1	ECO2-8	Panarea	Bottle, Niskin 5L	Bottle, Niskin 5L	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; bottom water for respiration experiment (UGent)

ECO2-8-MUFO-1	ECO2-8	Panarea	Multi fibre optics sensor mooring	Multi fibre optics sensor mooring	38.66378	15.11863	-15	2013-06-04T13:00:00	grey no gas; over the day
ECO2-8-PUC-10a	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K10)
ECO2-8-PUC-D2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K10) (UGent)
ECO2-8-PUC-C2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K10) (UGent)
ECO2-8-PUC-16a	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K15)
ECO2-8-PUC-A2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K15) (UGent)
ECO2-8-PUC-B2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K15) (UGent)
ECO2-8-PUC-7b	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K16)
ECO2-8-PUC-E2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K16) (UGent)
ECO2-8-PUC-F2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K16) (UGent)
ECO2-8-PUC-I	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K17)
ECO2-8-PUC-II	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K5)
ECO2-8-PW-4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K10)
ECO2-8-PW-5	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K15)
ECO2-8-PW-6	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; red with gas transplanted in grey no gas (K16)
ECO2-8-OGS-1	ECO2-8	Panarea		Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; microphytobenthos
ECO2-8-OGS-2	ECO2-8	Panarea		Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; microphytobenthos
ECO2-8-OGS-3	ECO2-8	Panarea		Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; microphytobenthos
ECO2-8-OGS-4	ECO2-8	Panarea		Sampling by diver	38.66378	15.11863	-15	2013-06-04T00:00:00	grey no gas; microphytobenthos
ECO2-8-SeagrassE-2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; LAI, epibionts
ECO2-8-PW-S1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; Porewater profile seagrass
ECO2-8-PW-S2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; Porewater profile seagrass
ECO2-8-PW-S3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; Porewater profile seagrass
ECO2-8-PUC-Exa	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; respiration experiment (UGent)
ECO2-8-PUC-Exb	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; respiration experiment (UGent)
ECO2-8-PUC-Exc	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; respiration experiment (UGent)
ECO-8-SeagrassK-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas (UGent)
ECO-8-SeagrassK-2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas (UGent)
ECO-8-SeagrassK-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas (UGent)
ECO2-8-Permeability-1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas;
ECO2-8-Permeability-2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas;
ECO2-8-Permeability-3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas;
ECO2-8-TL-2	ECO2-8	Panarea	Video camera	Video camera	38.66378	15.11863	-15	2013-06-05T09:30:00	grey no gas;
ECO2-8-UniB-2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; seagrass Foram (Uni. Bonn)
ECO2-8-NIS-2	ECO2-8	Panarea	Bottle, Niskin 5L	Bottle, Niskin 5L	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas;
ECO2-8-PW-7	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; grey no gas internal transplanted (K6)

ECO2-8-TUF-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; sediment and seagrass for TU Freiberg
ECO2-8-MUFO-2	ECO2-8	Panarea	Multi fibre optics sensor mooring	Multi fibre optics sensor mooring	38.66378	15.11863	-15	2013-06-05T16:00:00	grey no gas; over the night
ECO2-8-PW-8	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K12)
ECO2-8-PW-9	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K18)
ECO2-8-PUC-9b	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K12)
ECO2-8-PUC-G2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K12) (UGent)
ECO2-8-PUC-M1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K12) (UGent)
ECO2-8-PUC-12b	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K18)
ECO2-8-PUC-O1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K18) (UGent)
ECO2-8-PUC-D3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K18) (UGent)
ECO2-8-PUC-11a	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K6)
ECO2-8-PUC-L2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K6) (UGent)
ECO2-8-PUC-N1	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K6) (UGent)
ECO2-8-PUC-PCIII	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K20)
ECO2-8-PUC-PCIV	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	grey no gas; grey no gas internal transplanted (K6)
ECO2-8-PUC-Exd	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; respiration experiment (UGent)
ECO2-8-PUC-Exe	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; respiration experiment (UGent)
ECO2-8-PUC-Exf	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-05T00:00:00	grey no gas; respiration experiment (UGent)
ECO2-8-CHAM-1b	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas;
ECO2-8-CHAM-2b	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas;
ECO2-8-CHAM-3b	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas;
ECO2-8-CHAM-4b	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas;
ECO2-8-CHAM-5b	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas;
ECO2-8-CHAM-6b	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas;
ECO2-8-RCM-2	ECO2-8	Panarea	Current meter	Current meter	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas;
ECO2-8-TL-3	ECO2-8	Panarea	Video camera	Video camera	38.66248	15.11887	-17	2013-06-06T11:45:00	red with gas;
ECO2-8-FT-EEA20	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-FT-EEA21	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-FT-EEA22	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-FT-EEA23	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-FT-EEA24	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-FT-EEA25	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-FT-EEA26	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-FT-EEA27	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-FT-EEA28	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; natural sediment
ECO2-8-SS-EEA11	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA12	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA13	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA

ECO2-8-SS-EEA14	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA15	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA16	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA17	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA18	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA19	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA20	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; seawater for EEA
ECO2-8-FT-EEA33	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; red with gas internal transplanted (K4)
ECO2-8-FT-EEA30	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; red with gas internal transplanted (K13)
ECO2-8-FT-EEA31	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; red with gas internal transplanted (K2)
ECO2-8-FT-EEA36	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; grey no gas transplanted in red with gas (K3)
ECO2-8-FT-EEA37	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; grey no gas transplanted in red with gas (K1)
ECO2-8-FT-EEA38	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; grey no gas transplanted in red with gas (K9)
ECO2-8-FT-EEA29	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; grey no gas transplanted in red with gas (K9)
ECO2-8-FT-EEA34	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; grey no gas transplanted in red with gas (K3)
ECO2-8-FT-EEA32	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; red with gas internal transplanted (K13)
ECO2-8-FT-EEA35	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; red with gas internal transplanted (K8)
ECO2-8-SeagrassE-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-06T00:00:00	red with gas; LAI, epibionts
ECO2-8-PUC-I2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K2) (UGent)
ECO2-8-PUC-A3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K2) (UGent)
ECO2-8-PUC-C3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K2) (UGent)
ECO2-8-PUC-B3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K8) (UGent)
ECO2-8-PUC-E3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K8) (UGent)
ECO2-8-PUC-D4	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K8) (UGent)
ECO2-8-PUC-O2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K13) (UGent)
ECO2-8-PUC-M2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K13) (UGent)
ECO2-8-PUC-L3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-06T00:00:00	red with gas; natural sediments (K13) (UGent)
ECO2-8-PUC-N2	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-07T00:00:00	red with gas; natural sediments (K4) (UGent)
ECO2-8-PUC-M3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-07T00:00:00	red with gas; natural sediments (K9) (UGent)
ECO2-8-PUC-G3	ECO2-8	Panarea	Push corer	Push corer	38.66378	15.11863	-15	2013-06-07T00:00:00	red with gas; natural sediments (K2) (UGent)
ECO2-8-PUC-16b	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediment
ECO2-8-PUC-10b	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediment
ECO2-8-PUC-8a	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediment
ECO2-8-FT-21	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-22	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-23	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-24	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-25	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-26	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-27	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-28	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments

ECO2-8-FT-29	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-30	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-31	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-32	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-33	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-34	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-35	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-36	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-37	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-38	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-39	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-FT-40	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; natural sediments
ECO2-8-PW-10	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; Porewater profile
ECO2-8-PW-11	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; Porewater profile
ECO2-8-PW-12	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; Porewater profile
ECO2-8-PUC-V	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; extra core for freezing
ECO2-8-PUC-Exg	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; respiration experiment (UGent)
ECO2-8-PUC-Exh	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; respiration experiment (UGent)
ECO2-8-PUC-Exi	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; respiration experiment (UGent)
ECO2-8-PUC-Exj	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; respiration experiment (UGent)
ECO2-8-TL-4	ECO2-8	Panarea	Video camera	Video camera	38.66248	15.11887	-17	2013-06-07T09:00:00	red with gas;
ECO2-8-FLUCHAM-1a	ECO2-8	Panarea	Benthic fluid chamber	Benthic fluid chamber	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas;
ECO2-8-FLUCHAM-2a	ECO2-8	Panarea	Benthic fluid chamber	Benthic fluid chamber	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas;
ECO2-8-MUFO-3	ECO2-8	Panarea	Multi fibre optics sensor mooring	Multi fibre optics sensor mooring	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; over the night
ECO2-8-PUC-11b	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K3)
ECO2-8-PUC-F3	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K3) (UGent)
ECO2-8-PUC-L4	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K3) (UGent)
ECO2-8-PUC-6a	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K1)
ECO2-8-PUC-D5	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K1) (UGent)
ECO2-8-PUC-C4	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K1) (UGent)
ECO2-8-PUC-9c	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K9)
ECO2-8-PUC-B4	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K9) (UGent)
ECO2-8-PUC-N3	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K9) (UGent)
ECO2-8-PUC-VI	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K9)
ECO2-8-PUC-VII	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K1)
ECO2-8-PW-13	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K1)

ECO2-8-PW-14	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K9)
ECO2-8-PW-15	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas; grey no gas transplanted in red with gas (K3)
ECO2-8-NIS-3	ECO2-8	Panarea	Bottle, Niskin 5L	Bottle, Niskin 5L	38.66248	15.11887	-17	2013-06-07T00:00:00	red with gas;
ECO2-8-NIS-4	ECO2-8	Panarea	Bottle, Niskin 5L	Bottle, Niskin 5L	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas;
ECO2-8-TL-5	ECO2-8	Panarea	Video camera	Video camera	38.66248	15.11887	-17	2013-06-08T12:00:00	red with gas;
ECO2-8-5	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; bags documentation
ECO2-8-PUC-2a	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K13)
ECO2-8-PUC-J2	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K13) (UGent)
ECO2-8-PUC-N4	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K13) (UGent)
ECO2-8-PUC-12c	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K8)
ECO2-8-PUC-L5	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K8) (UGent)
ECO2-8-PUC-K2	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K8) (UGent)
ECO2-8-PUC-7c	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K4)
ECO2-8-PUC-F4	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K4) (UGent)
ECO2-8-PUC-H2	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K4) (UGent)
ECO2-8-PUC-VIII	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K2)
ECO2-8-PUC-IX	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K4)
ECO2-8-PW-16	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K4)
ECO2-8-PW-17	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K13)
ECO2-8-PW-18	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; red with gas internal transplanted (K8)
ECO2-8-6	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; test gas bubble device geomar
ECO2-8-Permeability-4	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas;
ECO2-8-Permeability-5	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas;
ECO2-8-Permeability-6	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas;
ECO2-8-Permeability-7	ECO2-8	Panarea	Push corer	Push corer	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas;
ECO2-8-TUF-2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; sediment and seagrass for TU Freiberg
ECO2-8-OGS-5	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-08T00:00:00	red with gas; microphytobenthos
ECO2-8-OGS-6	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-08T00:00:00	red with gas; microphytobenthos
ECO2-8-OGS-7	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-08T00:00:00	red with gas; microphytobenthos
ECO2-8-OGS-8	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-08T00:00:00	red with gas; microphytobenthos
ECO2-8-UniB-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; sediment and seagrass Foram (Uni. Bonn)
ECO-8-SeagrassK-4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas (UGent)
ECO-8-SeagrassK-5	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas (UGent)

ECO-8-SeagrassK-6	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas (UGent)
ECO2-8-NIS-5	ECO2-8	Panarea	Bottle, Niskin 5L	Bottle, Niskin 5L	38.66248	15.11887	-17	2013-06-08T00:00:00	red with gas; (Hydra)
ECO2-8-MUFO-4	ECO2-8	Panarea	Multi fibre optics sensor mooring	Multi fibre optics sensor mooring	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; over the day
ECO2-8-RCM-3	ECO2-8	Panarea	Current meter	Current meter	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-TL-6	ECO2-8	Panarea	Video camera	Video camera	38.66367	15.11895	-18	2013-06-09T11:00:00	grey with gas;
ECO2-8-CHAM-1c	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-CHAM-2c	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-CHAM-3c	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-CHAM-4c	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-CHAM-5c	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-CHAM-6c	ECO2-8	Panarea	Benthic Chamber	Benthic chamber	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-PW-19	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PW-20	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-6b	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-16c	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-X	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-NIS-6	ECO2-8	Panarea	Bottle, Niskin 5L	Bottle, Niskin 5L	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-PW-21	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-11c	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-8b	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-10c	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-9d	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-XI	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-PUC-A4	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-H3	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-G4	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-M4	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-N5	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-C5	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-B5	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-J3	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-D6	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-E4	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-PUC-I3	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment (UGent)
ECO2-8-FT-41	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-42	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-43	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-44	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-45	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-46	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-47	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-48	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-49	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-50	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-51	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-52	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-53	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-54	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-55	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment

ECO2-8-FT-56	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-57	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-58	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-59	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-FT-60	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas; normal sediment
ECO2-8-Permeability-8	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-Permeability-9	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-Permeability-10	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-Permeability-11	ECO2-8	Panarea	Push corer	Push corer	38.66367	15.11895	-18	2013-06-09T00:00:00	grey with gas;
ECO2-8-FLUCHAM-1b	ECO2-8	Panarea	Benthic fluid chamber	Benthic fluid chamber	38.66367	15.11895	-18	2013-06-10T08:45:00	grey with gas;
ECO2-8-FLUCHAM-2b	ECO2-8	Panarea	Benthic fluid chamber	Benthic fluid chamber	38.66367	15.11895	-18	2013-06-10T08:45:00	grey with gas;
ECO2-8-TL-7	ECO2-8	Panarea	Video camera	Video camera	38.66367	15.11895	-18	2013-06-10T09:00:00	grey with gas;
ECO2-8-FT-EEA39	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-FT-EEA40	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-FT-EEA41	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-FT-EEA42	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-FT-EEA43	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-FT-EEA44	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-FT-EEA45	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-FT-EEA46	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-FT-EEA47	ECO2-8	Panarea	Hand push corer	Hand push corer	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; natural sediment
ECO2-8-SS-EEA21	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA22	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA23	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA24	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	red with gas; seawater for EEA
ECO2-8-SS-EEA25	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	red with gas; seawater for EEA
ECO2-8-TUF-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; sediment and seagrass for TU Freiberg
ECO2-8-OGS-9	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	gray with gas; microphitobenthos
ECO2-8-OGS-10	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	gray with gas; microphitobenthos
ECO2-8-OGS-11	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	gray with gas; microphitobenthos
ECO2-8-UniB-4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; sediment Foram (Uni. Bonn)
ECO2-8-SeagrassE-4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; LAI, epibionts
ECO2-8-MUFO-5	ECO2-8	Panarea	Multi fibre optics sensor mooring	Multi fibre optics sensor mooring	38.66367	15.11895	-18	2013-06-10T16:00:00	grey with gas; over the night
ECO2-8-TCT-18	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; recovery terra cotta tile
ECO2-8-TCT-19	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; recovery terra cotta tile
ECO2-8-TCT-20	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; recovery terra cotta tile
ECO2-8-GLASS-18	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; recovery glass slides
ECO2-8-GLASS-19	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; recovery glass slides
ECO2-8-GLASS-20	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; recovery glass slides
ECO2-8-UniB-5	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; seagrass Foram (Uni. Bonn)
ECO2-8-SeagrassE-5	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; LAI, epibionts
ECO8-TUF-4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas; seagrass for TU Freiberg
ECO2-8-mosaic-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-10T00:00:00	grey with gas
ECO2-8-SeagrassE-6	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-10T00:00:00	grey no gas; LAI, epibionts
ECO2-8-NIS-7	ECO2-8	Panarea	Bottle, Niskin 5L	Bottle, Niskin 5L	38.66378	15.11863	-15	2013-06-10T00:00:01	grey no gas;
ECO2-8-SeagrassE-7	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-10T00:00:00	grey no oxygen dinamics

ECO2-8-PW-S4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; Porewater profile seagrass
ECO2-8-PW-S5	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; Porewater profile seagrass
ECO2-8-PW-S6	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; Porewater profile seagrass
ECO2-8-GAS-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; Exetainer (field GC), Gasmaus (Palermo)
ECO2-8-TCT-17	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; recovery terra cotta tile
ECO2-8-TCT-30	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; recovery terra cotta tile
ECO2-8-GLASS-17	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; recovery glass slides
ECO2-8-GLASS-30	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; recovery glass slides
ECO2-8-Marble-1	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	recovery transect from grey no gas to grey with gas
ECO2-8-7	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	overview map grey+ to grey-
ECO2-8-FLUCHAM-1c	ECO2-8	Panarea	Benthic fluid chamber	Benthic fluid chamber	38.66378	15.11863	-15	2013-06-11T00:00:00	grey no gas;
ECO2-8-FLUCHAM-2c	ECO2-8	Panarea	Benthic fluid chamber	Benthic fluid chamber	38.66378	15.11863	-15	2013-06-11T00:00:00	grey no gas;
ECO2-8-UniB-6	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-11T00:00:00	grey no gas; sediment Foram (Uni. Bonn)
ECO2-8-mosaic-2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas;
ECO2-8-UniB-7	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas; sediment Foram (Uni. Bonn)
ECO2-8-PW-S7	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas; Porewater profile seagrass
ECO2-8-PW-S8	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas; Porewater profile seagrass
ECO2-8-PW-S9	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas; Porewater profile seagrass
ECO2-8-GAS-2	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas; Exetainer (field GC), Gasmaus (Palermo)
ECO2-8-NIS-8	ECO2-8	Panarea	Bottle, Niskin 5L	Bottle, Niskin 5L	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas;
ECO2-8-TCT-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas; recovery terra cotta tile
ECO2-8-GLASS-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	red with gas; recovery glass slides
ECO2-8-Marble-2a	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	recovery transect from red with gas to grey with gas
ECO2-8-8	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-11T00:00:00	overview map red with gas to grey with gas
ECO2-8-TCT-16	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; recovery terra cotta tile
ECO2-8-GLASS-16	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66367	15.11895	-18	2013-06-11T00:00:00	grey with gas; recovery glass slides
ECO2-8-MUFO-6	ECO2-8	Panarea	Multi fibre optics sensor mooring	Multi fibre optics sensor mooring	38.66248	15.11887	-17	2013-06-12T09:00:00	red with gas; over the day
ECO2-8-mosaic-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-12T00:00:00	red with gas;
ECO2-8-mosaic-4	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-12T00:00:00	mosaic-transect to grey with gas
ECO2-8-Marble-2b	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66248	15.11887	-17	2013-06-12T00:00:00	recovery transect from red with gas to grey with gas
ECO2-8-TCT-31	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-12T00:00:00	grey no gas; recovery terra cotta tile
ECO2-8-TCT-32	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-12T00:00:00	grey no gas; recovery terra cotta tile
ECO2-8-TCT-33	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-12T00:00:00	grey no gas; recovery terra cotta tile
ECO2-8-TCT-36	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-12T00:00:00	grey no gas; recovery terra cotta tile
ECO2-8-GLASS-31	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-12T00:00:00	grey no gas; recovery glass slides
ECO2-8-GLASS-32	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-12T00:00:00	grey no gas; recovery glass slides
ECO2-8-GLASS-33	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-12T00:00:00	grey no gas; recovery glass slides
ECO2-8-GLASS-36	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.66378	15.11863	-15	2013-06-12T00:00:00	grey no gas; recovery glass slides
ECO2-8-GAS-3	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.38240	15.06570	-12	2013-06-12T00:00:00	Bottaro crater; Exetainer (field GC)
ECO2-8-A-01	ECO2-8	Panarea	Acoustic Doppler Current Profiler	Acoustic Doppler Current Profiler	38.63710	15.10965	-4.2	2013-06-12T16:18:00	Deployment 25 m SE Bottaro Crater, 3.5 mag, buoyancy failed over night
ECO2-8-A-02	ECO2-8	Panarea	Acoustic Doppler Current Profiler	Acoustic Doppler Current Profiler	38.63710	15.10965	-4.2	2013-06-13T11:00:00	Deployment 25 m SE Bottaro Crater, 3.5 mag
ECO2-8-A-03	ECO2-8	Panarea	Acoustic Doppler Current Profiler	Acoustic Doppler Current Profiler	38.63710	15.10965	-3.7	2013-06-14T12:00:00	Deployment 25 m SE Bottaro Crater, 4.0 mag

ECO2-8-A-04	ECO2-8	Panarea	Acoustic Doppler Current Profiler	Acoustic Doppler Current Profiler	38.63710	15.10965	-3.7	2013-06-16T12:00:00	Deployment 25 m SE Bottaro Crater, 4.0 mag
ECO2-8-A-05	ECO2-8	Panarea	Acoustic Doppler Current Profiler	Acoustic Doppler Current Profiler	38.63838	15.11099	-3	2013-06-18T16:00:00	Deployment between Bottaro and Lisca Bianca, 4.0 mag, upstream current
ECO2-8-CTD-01	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-6.2	2013-06-12T16:18:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with HydroC, buoyancy failed over night
ECO2-8-CTD-02	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-6.2	2013-06-13T11:00:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with HydroC, no data
ECO2-8-CTD-03	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-6.2	2013-06-14T12:00:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with HydroC
ECO2-8-CTD-04	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-6.2	2013-06-15T11:30:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with HydroC
ECO2-8-CTD-05	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-7.2	2013-06-15T18:00:00	Deployment 20 m SE Bottaro Crater, 0.5 mag, with HydroC
ECO2-8-CTD-06	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-4.2	2013-06-16T12:00:00	Deployment 20 m SE Bottaro Crater, 3.0 mag, with HydroC
ECO2-8-CTD-07	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-6.2	2013-06-16T19:00:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with HydroC
ECO2-8-CTD-08	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-3.2	2013-06-17T12:30:00	Deployment 20 m SE Bottaro Crater, 4.5 mag, with HydroC
ECO2-8-CTD-09	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63715	15.10962	-6.2	2013-06-17T18:00:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with HydroC
ECO2-8-CTD-10	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.6373	15.10961	-11.3	2013-06-18T09:00:00	Deployment Bottaro Crater, variable depth, with HydroC
ECO2-8-CTD-11	ECO2-8	Panarea	CTD, Seabird	CTD, Seabird	38.63838	15.11099	-5.3	2013-06-18T16:00:00	Deployment between Bottaro and Lisca Bianca, 2.0 mag, downstream current, with HydroC
ECO2-8-M-01	ECO2-8	Panarea		Grid	38.63748	15.10935	-12.0	2013-06-10T16:00:00	Bottaro crater, mapping
ECO2-8-M-02	ECO2-8	Panarea		Grid	38.63748	15.10935	-12.0	2013-06-11T08:30:00	Bottaro crater, mapping
ECO2-8-M-03	ECO2-8	Panarea		Grid	38.63748	15.10935	-12.0	2013-06-11T15:30:00	Bottaro crater, mapping
ECO2-8-M-04	ECO2-8	Panarea		Grid	38.63748	15.10935	-12.0	2013-06-12T09:30:00	Bottaro crater, mapping
ECO2-8-M-05	ECO2-8	Panarea		Grid	38.63748	15.10935	-12.0	2013-06-13T11:00:00	Bottaro crater, mapping
ECO2-8-M-06	ECO2-8	Panarea		Grid	38.63748	15.10935	-12.0	2013-06-14T10:00:00	Bottaro Crater, mapping,
ECO2-8-M-07	ECO2-8	Panarea		Video camera	38.63748	15.10935	-8.0	2013-06-14T10:00:00	mapping, flyover SE-NW, 4 mag
ECO2-8-GAS-01	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.6373	15.10961	-12	2013-06-14T16:00:00	Bottaro Crater, main field, @BMR (Pos. 28)
ECO2-8-GAS-02	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.6373	15.10961	-12	2013-06-15T09:30:00	Bottaro Crater, main field, @BMR (Pos. 28)
ECO2-8-GAS-03	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.6373	15.10961	-12	2013-06-16T10:00:00	Bottaro Crater, main field, @BMR (Pos. 28)
ECO2-8-GAS-04	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.6373	15.10961	-12	2013-06-16T17:00:00	Bottaro Crater, main field, @BMR (Pos 17, 32)
ECO2-8-GAS-05	ECO2-8	Panarea	Sampling by diver	Sampling by diver	38.6373	15.10961	-12	2013-06-17T09:30:00	Bottaro Crater, main vent field, @BMR (Pos. 32, X, T)
ECO2-8-F-01	ECO2-8	Panarea	Gas catcher	Gas catcher	38.63736	15.10949	-12	2013-06-11T15:30:00	Bottaro crater, vents F, A, C
ECO2-8-F-02	ECO2-8	Panarea	Gas catcher	Gas catcher	38.63736	15.10949	-12	2013-06-12T09:30:00	Bottaro crater, vent C
ECO2-8-F-03	ECO2-8	Panarea	Gas catcher	Gas catcher	38.63736	15.10949	-12	2013-06-13T16:00:00	Bottaro Crater, main field, vents A - F
ECO2-8-F-04	ECO2-8	Panarea	Gas catcher	Gas catcher	38.6373	15.10961	-12	2013-06-14T10:00:00	Bottaro Crater, main field
ECO2-8-F-05	ECO2-8	Panarea	Gas catcher	Gas catcher	38.63736	15.10949	-12	2013-06-14T16:00:00	Bottaro Crater, vent C
ECO2-8-F-06	ECO2-8	Panarea	Gas catcher	Gas catcher	38.63736	15.10949	-12	2013-06-15T09:30:00	Bottaro Crater, main vent field, vent C
ECO2-8-F-07	ECO2-8	Panarea	Gas catcher	Gas catcher	38.63736	15.10949	-12	2013-06-15T16:00:00	Bottaro Crater, main vent field, vent C
ECO2-8-F-08	ECO2-8	Panarea	Gas catcher	Gas catcher	38.6373	15.10961	-12	2013-06-16T10:00:00	Bottaro Crater, main vent field, along 28 m mark, vent C
ECO2-8-F-09	ECO2-8	Panarea	Gas catcher	Gas catcher	38.63736	15.10949	-12	2013-06-16T17:00:00	Bottaro Crater, main vent field, vent C
ECO2-8-F-10	ECO2-8	Panarea	Gas catcher	Gas catcher	38.63736	15.10949	-12	2013-06-17T09:30:00	Bottaro Crater, main vent field, vent C
ECO2-8-F-11	ECO2-8	Panarea	Gas catcher	Gas catcher	38.6373	15.10961	-11	2013-06-17T16:50:00	Bottaro Crater, main vent field

ECO2-8-HC-01	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-6.2	2013-06-12T16:18:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with CTD, buoyancy failed over night, battery change
ECO2-8-HC-02	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-6.2	2013-06-13T11:00:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with CTD
ECO2-8-HC-03	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-6.2	2013-06-14T12:00:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with CTD
ECO2-8-HC-04	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-6.2	2013-06-15T11:30:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with CTD
ECO2-8-HC-05	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-7.2	2013-06-15T18:00:00	Deployment 20 m SE Bottaro Crater, 0.5 mag, with CTD, fixed bubble deviator to water inlet
ECO2-8-HC-06	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-4.2	2013-06-16T12:00:00	Deployment 20 m SE Bottaro Crater, 3.0 mag, with CTD
ECO2-8-HC-07	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-6.2	2013-06-16T19:00:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with CTD
ECO2-8-HC-08	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-3.2	2013-06-17T12:30:00	Deployment 20 m SE Bottaro Crater, 4.5 mag, with CTD
ECO2-8-HC-09	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63715	15.10962	-6.2	2013-06-17T18:00:00	Deployment 20 m SE Bottaro Crater, 1.5 mag, with CTD
ECO2-8-HC-10	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.6373	15.10961	-11.3	2013-06-18T09:00:00	Deployment Bottaro Crater, variable depth, with CTD
ECO2-8-HC-11	ECO2-8	Panarea	CO2 Sensor	CO2 Sensor	38.63838	15.11099	-5.3	2013-06-18T16:00:00	Deployment between Bottaro and Lisca Bianca, 2.0 mag, downstream current, with CTD
ECO2-8-BP-01	ECO2-8	Panarea		Bubble parameterization rag	38.6373	15.10961	-12	2013-06-14T16:00:00	Set-up and 1st operation of BMR and GoPro Hero3 (@Pos. 28)
ECO2-8-BP-02	ECO2-8	Panarea		Bubble parameterization rag	38.6373	15.10961	-12	2013-06-15T09:30:00	Bottaro Crater, main vent field, operation of BMR and GoPro Hero3 (@ Pos. 28)
ECO2-8-BP-03	ECO2-8	Panarea		Bubble parameterization rag	38.6373	15.10961	-12	2013-06-16T10:00:00	Bottaro Crater, operation of BMR ,GoPro Hero3 and Canon D Mark III at main vent field (@ Pos. 28)
ECO2-8-BP-04	ECO2-8	Panarea		Bubble parameterization rag	38.6373	15.10961	-12	2013-06-16T17:00:00	Bottaro Crater, operation of BMR ,GoPro Hero3 and Canon D Mark III at main vent field, (@ Pos 17, 32)
ECO2-8-BP-05	ECO2-8	Panarea		Bubble parameterization rag	38.6373	15.10961	-12	2013-06-17T09:30:00	Bottaro Crater, operation of BMR ,GoPro Hero3 and Canon D Mark III at main vent field, (@ Pos.32, X, T)
ECO2-8-WS-01	ECO2-8	Panarea	Water sample	Water sample	38.6373	15.10961	-12	2013-06-14T16:00:00	Bottaro Crater, main field, @BMR (Pos 28)
ECO2-8-WS-02	ECO2-8	Panarea	Water sample	Water sample	38.6373	15.10961	-12	2013-06-15T09:30:00	Bottaro Crater, main field, @BMR (Pos. 28)
ECO2-8-WS-03	ECO2-8	Panarea	Water sample	Water sample	38.6373	15.10961	-12	2013-06-16T10:00:00	Bottaro Crater, main field, @BMR (Pos. 28)
ECO2-8-WS-04	ECO2-8	Panarea	Water sample	Water sample	38.6373	15.10961	-12	2013-06-16T17:00:00	Bottaro Crater, main field, @BMR (Pos 17, 32)
ECO2-8-WS-05	ECO2-8	Panarea	Water sample	Water sample	38.63715	15.10962	-12	2013-06-16T19:00:00	20 m SE Bottaro Crater, @ water inlet, HydroC
ECO2-8-WS-06	ECO2-8	Panarea	Water sample	Water sample	38.6373	15.10961	-12	2013-06-17T09:30:00	Bottaro Crater, main vent field, @BMR (Pos. 32, X, T)
ECO2-8-WS-07	ECO2-8	Panarea	Water sample	Water sample	38.63715	15.10962	-12	2013-06-18T12:33:00	20 m SE Bottaro Crater, @ water inlet, HydroC
ECO2-8-DYE-01	ECO2-8	Panarea		Fluorescene dye experiment	38.63736	15.10949	-11	2013-06-17T16:00:00	Optical survey of fluorescene dye injection with GoPro Hero3 and Canon D Mark III, Bottaro Crater, vent C
ECO2-8-DYE-02	ECO2-8	Panarea		Fluorescene dye experiment	38.63838	15.11099	-7	2013-06-18T16:00:00	Optical survey of fluorescene dye injection with GoPro Hero3 and Canon D Mark III between Bottaro and Lisca Bianca ("Whirlpool")